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DECISION NOTICE
ADOPTION OF EXISTING ENVIRONMENTAL REVIEW

Central Post and Treating Company CECRA Facility: Phase II, Capping and Site Reclamation
September 2022
City of Lewistown
47.076771, -107.406673
Fergus County

Existing Environmental Review Document: Tetra Tech Voluntary Clean Up Plan for Montana Department of Environmental Quality – Environmental Assessment

Type and Purpose of Action

The City of Lewistown (City), with the support of the Montana Department of Environmental Quality (DEQ), is proposing to use a DNRC RDG Project grant of $500,000 for the cleanup of the Central Post and Treating Company Comprehensive Environmental Cleanup and Responsibility Act (CECRA) Facility in Lewistown, MT. The Facility is in the northeast corner of Lewistown approximately 0.5 miles north of East Main Street on Marcella Avenue. From 1968 to 1973 a post and pole operation treated timbers using a mixture of pentachlorophenol and diesel on the surface of a closed city landfill.

Using a combination of DNRC Planning Grants, Project Grants, DEQ Orphan Share Account funds, and Brownfields funds, DEQ, in partnership with the City, investigated the nature and extent of contamination at the facility. Soil samples showed exceedances of generic direct contact and leaching to groundwater screening levels for pentachlorophenol and dioxins/furans. A removal was conducted for the soils impacted by pentachlorophenol in November 2018; however, confirmation samples indicated the extent of contamination was greater than initially thought. DEQ conducted additional sampling to fully delineate the contamination, determining approximately 330 cubic yards of soil will require removal. Eighty of the 330 cubic yards will need to be disposed of as hazardous waste at a licensed RCRA facility; the remaining 250 cubic yards will be disposed of at a local landfill after applying for a “no longer contained-in” determination.

The City is proposing to use this RDG Project Grant to construct a protective soil cap at the facility. Placement of a cap will preserve and enhance natural resources including surface and subsurface soils, native vegetation and wildlife, and regional groundwater by eliminating the risk of exposure to contaminants and turning this CECRA Superfund site into pollinator habitat that will benefit the local ecosystem and nearby agricultural lands.

The City of Lewistown proposes to begin construction of the cap September 2022.

Explanation of the decision(s) that must be made regarding the proposed action (i.e. approve grant or loan and provide funding):

DNRC will approve the grant to provide funding for the City of Lewistown Central Post and Treating Company CECRA Facility: Phase II, Capping and Site Reclamation Project.

Criteria for Adopting Existing Environmental Review

☒The existing environmental review covers an action paralleling or closely related to the proposed action.

☒The information in the existing environmental review is accurate and clearly presented.

☒The information in the existing environmental review is applicable to the action being considered.

☒All appropriate Agencies were consulted during preparation of the existing environmental review.

☒Alternatives to the proposed action evaluated as part of the existing environmental review effort.

☒The impacts of the proposed action been accurately identified as part of the existing environmental review.

☒The existing environmental review identifies any significant impacts as a result of the proposed action and those identified will they be mitigated below the level of significance.

Adopt

The existing environmental review can be considered sufficient to satisfy DNRC's MEPA review responsibilities. No further analysis needed.

Existing Analysis Reviewed By:	**Name:**	Demitra Blythe	**Date:**	1/5/2022
	Title:	CARD Division MEPA/NEPA Coordinator		
	Email:	Demitra.Blythe@mt.gov		

Approved By:	Name:	Mark Bostrom		
	Title:	CARD Division Administrator		
Signature:	DocuSigned by: Mark W Bostrom BF7A1C30B2AF4DE...		**Date:**	1/25/2022 | 8:49:36 AM MST

Adopt with expanded information to satisfy MEPA review.

The existing environmental review can be considered sufficient to satisfy DNRC's MEPA responsibilities. Items on this adoption form required further information/analysis which is provided herein. Upon review of that analysis, I find that none of the impacts are severe, enduring, geographically widespread, or frequent. Further, I find the quantity and quality of the natural resources, including any that may be considered unique or fragile, will not be adversely affected to a significant degree. I find no precedent for the future actions that would cause significant impacts, and I find no conflict with local, State, or federal laws, requirements, or formal plans. No Further Analysis needed.

AIR QUALITY:
What pollutants or particulate would be produced (i.e. particulate matter from road use or harvesting, slash pile burning, prescribed burning, etc)? Identify the Airshed and Impact Zone (if any) according to the Montana/Idaho Airshed Group. Identify direct, indirect, and cumulative effects to air quality.

The surface soil on the site is contaminated with pentachlorophenol, dioxins, and heavy metals. Limited vegetation makes the site prone to wind erosion and dust.
Proposed Alternative – Potentially beneficial as the placement of a protective cap will directly, indirectly, and cumulatively benefit air quality of the site and in surrounding areas by preventing fugitive dust sources from the exposed, contaminated soils on the site.

No Action – The site will continue to erode and contain soils high in toxic pentachlorophenol, dioxins, and heavy metals, posing a significant risk of reduced air quality with any wind erosion events.

HISTORICAL AND ARCHAEOLOGICAL SITES:
Identify and determine direct, indirect, and cumulative effects to historical, archaeological or paleontological resources.

The Facility hosts no permanent structures. However, the current operator maintains a camper for use as a part-time residence and office. The Facility is not paved and most of the current operations are limited to the southern half of the property.

Based on an interview with the previous wood treatment operator, the historical wood treatment operation had a dip tank that was in the west-central part of the Facility (Seyler and Janssen 2015). Logs treated with the mixture of PCP and diesel were transferred to a drying area in the eastern part of the property, where they were placed on the ground to dry. The drying area is similar to the location now used to stack logs for the mill. Figure 3 (Appendix A) within the VCP EA shows the location of the historical treatment and drying areas.

Proposed Alternative – Potentially adverse impacts to any historical and/or archaeological sites as the project will be installing a soil cap across much of the project area; however, the applicant did not identify any known cultural or historical resources. If previously unknown cultural or paleontological materials are identified during project related activities, all work will cease until a professional assessment of such resources can be made.

No Action – No impact to historical or archaeological resources.

AESTHETICS:
Determine if the project is located on a prominent topographic feature, or may be visible from populated or scenic areas. What level of noise, light or visual change would be produced? Identify direct, indirect, and cumulative effects to aesthetics.

The site is currently used for industrial operations and supports little vegetation and wildlife. The site currently contains machinery for cutting wood, and several vehicles and shipping containers.

Proposed Alternative – Potentially beneficial as reclaiming the site by installation of a soil cap and native pollinator habitat will provide an aesthetically pleasing open space area for the public and neighboring properties.

No Action – The site will continue be an open space with little vegetation and wildlife.

HUMAN HEALTH AND SAFETY:
Identify any health and safety risks posed by the project.

While the site is currently gated and not accessible to the public, trespassers have been reported on the site.

Proposed Alternative – Potentially beneficial as eliminating the risk of direct contact with contaminants resulting from soil contamination and fugitive dust provides a benefit to public health and safety for those both on and nearby the site.

No Action – There will continue to be a risk of direct contact with the soil contamination and dust, which contain high concentrations of pentachlorophenol and heavy metals. These contaminants pose a significant risk to human health and safety as they are known to cause respiratory issues, cancer, and other health problems.

INDUSTRIAL, COMMERCIAL AND AGRICULTURE ACTIVITIES AND PRODUCTION:
Identify how the project would add to or alter these activities.

The site is currently used for industrial purposes and is leased to a tenant with a small firewood cutting operation.

Proposed Alternative – Potentially adverse impacts as the site would no longer be used for industrial purposes, instead it will be reclaimed with native pollinator habitat. The applicant did not discuss how they would mitigate the industrial loss for the current tenant.

No Action – No impact to industrial activities or production. The current tenant would remain on the property and continue their woodcutting operation.

QUANTITY AND DISTRIBUTION OF EMPLOYMENT:
Estimate the number of jobs the project would create, move or eliminate. Identify direct, indirect, and cumulative effects to the employment market.

There are 2,632 individuals over 16 employed in the city of Lewistown (data.census.gov - American Community Survey five-year estimate data). The site currently has tenants who have a small logging operation on site.

Proposed Alternative – Potentially beneficial as the construction of the cap would employ local workforces, creating employment opportunities for Lewistown residents. Volunteers will be needed after the cap is constructed to maintain and observe the native vegetation.

No Action – Potentially no impact to quantity or distribution of employment.

LOCAL AND STATE TAX BASE AND TAX REVENUES:
Estimate tax revenue the project would create or eliminate. Identify direct, indirect, and cumulative effects to taxes and revenue.

The site does not currently affect tax base and revenue.

Proposed Alternative – Potentially beneficial as the removal of this site from the CECRA list will benefit taxpayers in the City, as the City would no longer bear the burden of financing a cleanup for the site. Property values of surrounding lands would also increase.

No Action – No impact to local and state tax base or tax revenues.

DEMAND FOR GOVERNMENT SERVICES:
Estimate increases in traffic and changes to traffic patterns. What changes would be needed to fire protection, police, schools, etc.? Identify direct, indirect, and cumulative effects of this and other projects on government services

The site does not currently provide a community or government service; although it is owned by the City, it is leased to tenants who use it for industrial purposes.

Proposed Alternative – Potentially beneficial because once native pollinator habitat is established, the site can be used as a facility for native plant and pollinator education for groups such as 4H. The site will also be accessible to the public and will provide an aesthetically pleasing open space area.

No Action – No impact to demand for government services.

LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS:
List State, County, City, USFS, BLM, Tribal, and other zoning or management plans, and identify how they would affect this project.

The site is currently used for industrial purposes and is listed as a Montana DEQ CECRA site (Comprehensive Environmental Cleanup and Responsibility Act).

Proposed Alternative – Potentially beneficial as cleanup of the site would delist it from being on the CECRA list. In addition, one of the adjacent properties has recently been subdivided for residential use. Reclaiming the site with native pollinator habitat will benefit residential development by creating an aesthetically pleasing natural area and will eliminate the impacts of fugitive dust from the site.

No Action – Site would remain contaminated and on the CECRA list, costing the City of Lewistown in fees associated with the cleanup of the site.

ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES:
Identify any wilderness or recreational areas nearby or access routes through this tract. Determine the effects of the project on recreational potential within the tract. Identify direct, indirect, and cumulative effects to recreational and wilderness activities.

This site is currently used for industrial operations and is gated and not accessible to the public.

Proposed Alternative – Potentially beneficial as the project would result in the creation of a new open space area for the City of Lewistown that would be accessible to the public.

No Action – The site would continue to be inaccessible to the public and create a public health hazard with the levels of contamination at the site.

DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING:
Estimate population changes and additional housing the project would require. Identify direct, indirect, and cumulative effects to population and housing.

The population of Fergus County in 2020 was approximately 11,446 individuals (3.6% increase for the County; MT Dept. of Commerce: http://ceic.mt.gov). In addition, there are approximately 5,896 housing units in Fergus County (2019 data; https://ceic.mt.gov/People-and-Housing/Housing).

Proposed Alternative – No impact is expected to the county population. Given the project is expected to be short-term, no additional housing is expected.

No Action – No impact to density and distribution of population and housing.

SOCIAL STRUCTURES AND MORES:
Identify potential disruption of native or traditional lifestyles or communities.

The site is currently surrounded by agricultural land, a golf course, and a concrete plant. The site does not currently benefit any of these lifestyles or communities.

Proposed Alternative – Potentially beneficial to nearby residents as a protective soil cap and native vegetation will create an aesthetically pleasing open area and may beneficially impact the sale of the recently subdivided residential lots that are adjacent to the site.

No Action – No impact to social structures or more.

CULTURAL UNIQUENESS AND DIVERSITY:
How would the action affect any unique quality of the area?

The site is currently used for industrial operations and supports little vegetation and wildlife. The site currently contains machinery for cutting wood, and several vehicles and shipping containers.

Proposed Alternative – Potentially beneficial as the protective soil cap and native vegetation would create an aesthetically pleasing open area and provide a unique area of recreation with the establishment of native pollinator habitat.

No Action – No impact to cultural uniqueness and diversity.

Clean Water and/ Drinking Water:
Identify potential future impacts to water and wastewater infrastructure capital improvements, including the installation and replacement of failing treatment and distribution systems, wastewater treatment plants. Identify direct, indirect, and cumulative effects likely to occur as a result of the proposed action.

While the site has not currently impacted groundwater, prolonged exposure of soils to precipitation leaves the groundwater at risk for contaminant leaching. There are currently no stormwater controls on the site.

Proposed Alternative – Potentially beneficial as the protective cap will be designed for stormwater management, which will prevent soil erosion and provide drainage controls. In addition, the surrounding lands include agricultural property and a golf course, both of which use groundwater for irrigation. The protective cap will prevent future leaching to groundwater and impact to these groundwater resources.

No Action – The site may eventually impact groundwater if left untreated as there is still a risk of contaminant leaching through the soils.

Central Post and Treating Company
CECRA Facility

FIGURE 2

FACILITY MAP

TETRA TECH

DRAFT

Voluntary Cleanup Plan Environmental Assessment

Central Post and Treating Company

Marcella Avenue, Lewistown, Montana

Project #103S320337
APRIL 28, 2017

PRESENTED TO

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Title

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APPENDIX H – REGULATORY DOCUMENTS

APPENDIX I – WORK PLANS

APPENDIX J – FIELD NOTES & FIELD LOGS

APPENDIX K – PHOTOGRAPH LOG

APPENDIX L – LABORATORY ANALYTICAL REPORTS & DATA VALIDATION

APPENDIX M – WASTE DISPOSAL DOCUMENTS

APPENDIX N – SITE-SPECIFIC SCREENING LEVEL CALCULATIONS

APPENDIX O – RISK ASSESSMENT

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
>	Greater than
<	Less than
%	Percent
°C	Degrees Celsius
°F	Degrees Fahrenheit
µS/cm	microSiemens per centimeter
µg/dL	Micrograms per deciliter
µg/L	Micrograms per liter
amsl	Above mean sea level
ARM	Administrative Rules of Montana
AUL	Activity use limitation
bgs	Below ground surface
Btoc	Below top of casing
BTV	Background threshold value
CALA	Controlled Allocation of Liability Act
CDC	Centers for Disease Control and Prevention
CECRA	Comprehensive Environmental Cleanup and Responsibility Act
COPC	Contaminant of potential concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CLP	Contract Laboratory Program
COPC	Contaminant of potential concern
CPTC	Central Post and Treating Company
DAF	Dilution attenuation factor
CSM	Conceptual Site Model
DC	Direct contact
DEL SHWS	Delisted solid and hazardous waste site
DEQ	Montana Department of Environmental Quality
Dioxin	Polychlorinated dibenzo-p-dioxin
DNRC	Department of Natural Resources & Conservation
EA	Environmental Assessment
ECO-SSL	Ecological Soil Screening Level
EDR	Environmental Data Resources, Inc.
EPA	U.S. Environmental Protection Agency
EPC	Exposure point concentration
EPH	Extractable Petroleum Hydrocarbon
ERA	Ecological Risk Assessment
ERBSC	Ecological Risk Based Screening Concentration
ESA	Environmental Site Assessment
Facility	Central Post and Treating Company Facility
FEMA	Federal Emergency Management Agency
ft	Feet
ft^2	Square foot

Acronyms/Abbreviations	Definition
Furan	Polychlorinated dibenzofuran
gpm	Gallons per minute
GWIC	Ground Water Information Center
HI	Hazard index
HHS	Human Health Standard
HMW	High molecular weight
HQ	Hazard Quotient
IEUBK	Integrated Exposure Uptake Biokinetic Model
in.	Inches
Kd	Soil-water partitioning coefficient
kg/L	Kilogram per liter
L	Liter
LC	Leachate criterion
LMW	Low molecular weight
MBMG	Montana Bureau of Mines and Geology
MCA	Montana Code Annotated
MCPA	2-methyl-4-chlorophenoxyacetic acid
MDHES	Montana Department of Health and Environmental Sciences
MDL	Method detection limit
mg/day	Milligrams per day
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
mph	Miles per hour
MNHP	Montana Natural Heritage Program
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NAD83	North American Datum, 1983
NAVD88	North American Vertical Datum, 1988
ng/kg	Nanograms per kilogram
NPL	National Priorities List
OCDD	Octachlorodibenzodioxin
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCP	Pentachlorophenol
pg/L	Picograms per liter
PGW	Protection of groundwater
PID	Photoionization detector
ppm	Part per million
PQL	Practical quantitation limit
PVC	Polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified environmental professional
RBCA	Risk-Based Corrective Action
RBSL	Risk-based Screening Levels
RCRA	Resource Conservation and Recovery Act
RP	Remediation proposal
RPD	Relative percent difference

Acronyms/Abbreviations	Definition
RRV	Required Reporting Value
RSL	EPA Regional Screening Levels
SAP	Sampling and Analysis Plan
SCEM	Site Conceptual Exposure Model
SHWS	Solid Hazardous Waste Sites
SOP	Standard Operating Procedure
SPLP	Synthetic precipitation leaching procedure
SVOC	Semivolatile organic compound
SSL	Soil screening level
TCDD	2,3,7,8-tetrachlorodibenzodioxin
TEF	Toxic equivalent factor
TEH	Total Extractable Hydrocarbons
TEQ	Toxicity equivalent
Tetra Tech, Inc.	Tetra Tech
TMDL	Total Maximum Daily Load
TPH	Total Petroleum Hydrocarbon
TR	Target Risk
USGS	U.S. Geological Survey
VCP	Voluntary Cleanup Plan
VCRA	Voluntary Cleanup and Redevelopment Act
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbon
WRCC	Western Regional Climate Center

1.0 PROJECT INTRODUCTION

1.1 VCP SUBMITTAL

This Voluntary Cleanup Plan (VCP) Environmental Assessment (EA) is being submitted on behalf of the City of Lewistown. This VCP addresses the entire 6.3-acre Central Post and Treating Company (CPTC) facility (the Facility) located on Marcella Avenue in Lewistown, Fergus County, Montana (**Figure 1**, **Appendix A**). The Facility is currently owned by the City of Lewistown, the VCP applicant. The City of Lewistown's contact information is listed below:

Holly Phelps
City Manager, City of Lewistown
305 West Watson
Lewistown, Montana 59457
(406) 535-1760
hphelps@ci.lewistown.mt.us

The Facility is listed under Montana Department of Environmental Quality's (DEQ's) Comprehensive Environmental Cleanup and Responsibility Act (CECRA) Program as a low priority state Superfund facility. The Facility became a CECRA-listed facility based on concerns that the historical landfill, wood treatment, and other operations at the Facility have affected soil and groundwater.

1.2 VCP PREPARATION

Section 75-10-734(1), Montana Code Annotated (MCA), states that DEQ may accept only VCPs that are prepared by a qualified environmental professional (QEP). This VCP was prepared by the following QEPs:

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Ms. Morrow is a Project Manager and Senior Environmental Geologist with Tetra Tech, Inc. (Tetra Tech). She has more than 23 years of environmental consulting experience in management and implementation of environmental assessment and remediation.

Mr. Morford is an Environmental Scientist with Tetra Tech. He has 2 years of environmental consulting experience and more than 10 years of experience in environmental investigations.

Appendix D presents a copy of Ms. Morrow's and Mr. Morford's qualifications and résumés. Section 1.3 presents the organization of VCP appendices.

1.3 VCP ORGANIZATION

Section 2 of this document presents the EA and Section 3 presents references. Section 2, Environmental Assessment, is organized as outlined in DEQ's VCP guidance document. Appendices for this document are as follows:

- Appendix A – Figures
- Appendix B – Tables
- Appendix C – Written Consent of Owners, Access, & DEQ Reimbursement
- Appendix D – Qualifications of Preparer
- Appendix E – Ownership & Historical Records
- Appendix F – Climate, Wells & Flood, & EDR Radius Map
- Appendix G – Area Wells, Ordinances, & Planning
- Appendix H – Regulatory Documents
- Appendix I –- Work Plans
- Appendix J – Field Notes & Field Logs
- Appendix K – Photograph Log
- Appendix L – Laboratory Analytical Reports & Data Validation
- Appendix M – Waste Disposal Documents
- Appendix N – Site-Specific Screening Level Calculations
- Appendix O – Risk Assessment

2.0 ENVIRONMENTAL ASSESSMENT

2.1 INTRODUCTION

MCA Sections 75-10-730 to 738, Voluntary Cleanup and Redevelopment Act (VCRA), was promulgated to:

> *"…provide for the protection of the public health, welfare, and safety and of the environment and to foster the cleanup, transfer, reuse, or redevelopment of facilities where releases or threatened releases of hazardous or deleterious substances exist."*

This VCP EA is being submitted to the DEQ on behalf of the City of Lewistown (the applicant; see Section 1) according to MCA Section 75-10-736(1) as the first part of a VCP designed to meet the requirements of the VCRA. This EA addresses the entire Facility located on Marcella Avenue in Lewistown, Fergus County, Montana.

DEQ initiated a Phase II Environmental Site Assessment (ESA) at the Facility in February 2016 through the Orphan Share Account and a Department of Natural Resources & Conservation (DNRC) planning grant. The Phase II ESA was conducted by Tetra Tech to (1) characterize contamination at the Facility; (2) identify which contaminants may pose a risk to human health and the environment; and (3) formulate a list of contaminants of potential concern (COPCs). Additional investigations were conducted in September and October 2016 and February 2017 to further delineate the extent of contamination.

2.1.1 General Facility Information

The Facility is owned by the City of Lewistown. It is located on Marcella Avenue, approximately 0.4 mile north of Highway 87 on the east side of Lewistown (**Figure 2, Appendix A**). The Facility contains a historical landfill (4.4 acres) that operated from the early 20th Century to the mid-1960s. A historical wood treating operation also operated on site from 1968 to 1973, which included a dip tank to treat wood posts with a mixture of pentachlorophenol (PCP) and diesel. The posts were stacked on the ground to dry. Currently, the Facility is leased to an individual who operates a small wood mill to manufacture wood posts and a biofuels operation. The current operations do not include treatment of the wood posts.

During closure of the landfill sometime in the mid-1960s, the City of Lewistown installed a 2-foot clay cap over the waste disposal area. In the 1990s, the City of Lewiston deposited between 2 and 4 feet of street sweepings (fine sands to gravel) over the clay cap. Currently, the landfill cap is discontinuous across the property and varies from 0 to 4 feet in depth (see Section 2.9.8.2). Landfill waste is currently exposed at the soil surface in some locations.

Contemporary operations at the Facility occupy 2.5 acres and are limited to the southern and central portion of the property. The following areas and materials were observed on site during 2016 and 2017 investigations:

- Small wood mill for preparing firewood and posts;
- Multiple staging areas for transportation equipment for trucking operation (tractor-trailer, shipping containers, personal vehicles, and small tractors);
- Biofuels production area (large bulk containers including drums and pallets);
- Boneyard for industrial and agricultural implements;
- Camper (Fifth Wheel) used intermittently by current tenants as a residence and office;
- Dispersed waste (including lead-acid batteries) from clandestine dumping and discarded materials from biofuel production.
- Burn pile for unused wood waste and site garbage.

These areas and materials are documented in the photographic log (Appendix K) and identified in the detailed site map (**Figure 3, Appendix A**).

Adjoined properties have multiple land uses (**Figure 2, Appendix A**). The property to the north and east of the Facility (Shadows Estates) was recently sub-divided into 1-acre residential parcels that have yet to be developed. Property to the west of the Facility (across Marcella Avenue) is owned by the Weeden Ranch and is used as agricultural rangeland. The City of Lewiston operates a “green” waste facility and burn pile for tree and yard debris to the southwest. Kodiak Concrete operates a concrete and quarry operation to the south. Breed Creek is located 540 feet northwest of the Facility, and is bordered by a small riparian areas. Additionally, there is a small commercial telecommunications office located 500 southwest of the Facility (Mid-Rivers Communication).

The closest rural residence is 900 feet south of the Facility, and urban residential areas are 1,400 feet southwest. However, residences will be directly adjacent to the landfill once Shadows Estates is developed.

The Facility sees light vehicle traffic from the adjacent Marcella Avenue, with most traffic related to residential access or commercial access to a nearby golf course. Traffic through the area may increase with future residential development of the surrounding land.

2.1.2 Type and Source of Contamination

Potential sources of contamination at the Facility include:

- Wastes and soil impacts created by operation of the Facility as a historical, unsanctioned waste disposal landfill;
- Burning of waste in the historical landfill;
- Soil impacts from active wood milling (firewood and posts) and biofuel operations; and
- Street sweepings placed on site by the City of Lewistown.

2.1.3 Facility Eligibility

MCA Sections 75-10-732(1)(a) through (e) state the eligibility criteria for voluntary cleanup procedures. Eligible facilities <u>may not be</u>:

> *"a) A facility that is listed or proposed for listing on the National Priorities List (NPL) pursuant to 42 U.S.C. 9601, et seq.; or*
>
> *b) A facility for which an order has been issued or consent decree has been entered into pursuant to this part; or*
>
> *c) A facility that is the subject of an agency order or an action filed in district court by any state agency that addresses the release or threatened release of a hazardous or deleterious substance; or*
>
> *d) A facility where the release or threatened release of a hazardous or deleterious substance is regulated by the Montana Hazardous Waste Act and regulations under that act; or*
>
> *e) A facility that is the subject of pending action under this part because the facility has been issued a notice commencing a specified period of negotiations on an administrative order on consent."*

The Facility meets the eligibility requirements for a VCP because:

- None of the above criteria apply to the Facility; and
- The Facility has had "a release or threatened release of a hazardous or deleterious substance that may present an imminent and substantial endangerment to the public, health, safety, or welfare or the environment…"

Modifications to the VCRA in 2009 require submittal and approval of an EA before a remediation proposal (RP) can be submitted for the Facility [Sections 75-10-736(1) and (2), MCA]. This EA address all of the requirements for an EA listed in Sections 75-10-734(2), MCA. An RP will be submitted following the DEQ's determination that this EA is complete. The Facility also meets the 60-month time limitation specified in Section 75-10-736(6), MCA.

2.1.4 VCP Elements

This VCP follows the VCRA Application Guide (DEQ 2012a). Section 75-10-733, MCA states the VCP must include:

1. An EA of the Facility that includes the information required in Section 75-10-734(2), MCA;
2. An RP that includes the information required in Section 75-10-734, MCA, which meets the requirements in Section 75-10-721, MCA;
3. A written consent of the Facility or property owners for implementation of the VCP and access to the Facility by the applicant, its agents, and the DEQ.

The above elements are addressed in Sections 1 and 2 of this document. The written consent of the owner is described in Section 2.2 and included in **Appendix C**. The RP will be prepared and submitted following the DEQ's determination that this VCP-EA is complete.

2.1.5 DEQ Reimbursement

The applicant, City of Lewistown, agrees to reimburse the DEQ for the State of Montana's remedial action costs as required by Section 75-10-733(3), MCA. **Appendix C** includes a written statement by the City of Lewistown representatives that the applicant will reimburse the DEQ for any remedial action costs that the DEQ incurs during the review and oversight of the VCP.

2.2 LEGAL DESCRIPTION AND FACILITY MAP

The Facility is a triangular-shaped parcel of approximately 6.3 acres in size and is located on Marcella Avenue in the northeastern portion of Lewistown, Fergus County, Montana. The southwest property boundary is approximately 1,038 feet (0.2 miles) north of the intersection of Appleblossom Lane (nearest cross street) and 2,250 feet (0.4 miles) north of the intersection with Highway 87.

A barbwire fence surrounds the property and is located along the current property line. Entry from Marcella Avenue is gated, but the gate is left open when site occupants are present. Roads to the north and east are private and do not provide direct vehicle access to the Facility. The east-west road directly north of the Facility is gated and posted as private property at Marcella Avenue.

The Facility hosts no permanent structures. However, the current operator maintains a camper for use as a part-time residence and office. The Facility is not paved and most of the current operations are limited to the southern half of the property. Within the perimeter of the old landfill, the land surface is relatively flat (less than a 2 percent [%] slope). Steep slopes (15 – 30%) characterize the north, east, and west extents of the historic landfill.

Figure 1 (Appendix A) shows the Facility location in relation to the city of Lewistown and in Montana. **Figures 2 and 3 (Appendix A)** present a site map and detailed site map showing the Facility, Facility features, adjoining properties, and area utilities. Table 2.2-1, below, presents the Facility's legal and location details.

Table 2.2-1. Facility Legal Description and Location Details

Legal / Location Item	Description / Detail
County	Fergus
Distance to Nearest Town	Facility resides at the northeast edge of Lewistown, Montana
Geocode Number	08-2467-11-4-02-10-0000
Legal Description	S11, T15 N, R18 E, M & B TRACT In SWNE & NWSE SEE BK 134 PG 598 CITY DUMP
Township, Range, Section	Township 15 North, Range 18 East, NW¼ of NW¼ of SE¼ of Section 11
Latitude	47^{0}4'36.08" North
Longitude	109^{0}24'24.63" West
Elevation	4028 feet (at well GW01)

Latitude and longitude are in WGS84 datum, as per VCP.
Elevation is NAVD88 U.S. feet and based on on-site survey in 2016 by Stahly Engineering & Associates.

2.2.1 Property Deeds

Tetra Tech requested copies of available property deeds for the Facility through the City of Lewiston. The only known Warranty Deed on file for the property was a 1960 deed that did not pertain to the landfill. The deed is for a 20-acre property located in the S½ SE¼ NE¼ of Section 2 in Township 15 North, Range 18 East. This deed does not appear to be associated with the Facility since the Facility is within Section 11, not Section 2. **Appendix E** provides a copy of the available property records and related ownership information.

2.2.2 Consent of Current Owners

Section 75-10-733(2)(c), MCA requires that both the VCP EA and RP components include written consent of the current facility owner and facility access by the applicant, its agents, and DEQ. **Appendix C** includes a copy of City of Lewistown's Written Consent of Current Owners.

Facility investigations were completed in 2016. Investigations on adjoining properties to the south (Kodiak Concrete), north-east (Shadows Estates), and west (Weeden Ranch) were also conducted in 2016. Surface soil samples were collected on all three properties, and a monitoring well was installed on the Weeden Ranch property approximately 180 feet west of the northwest corner of the Facility. **Appendix C** includes copies of DEQ access agreements for all three properties.

2.3 PHYSICAL CHARACTERISTICS

Section 75-10-734(2)(b), MCA, requires the VCP include a description of physical characteristics of the Facility and areas contiguous to the Facility.

2.3.1 Facility Features

The following sections provide physical descriptions of features at, and contiguous to, the Facility.

2.3.1.1 Buildings and Grounds

There are no permanent buildings at the Facility. Current tenants maintain a camper in the south-central part of the property that is used as an office and part-time residence. The grounds contain a small wood mill for preparing posts and firewood, stacks of posts and saw logs, a centralized area used for production of biofuels, tractor-trailer parking, and a boneyard for agricultural equipment. The wood posts are not treated on site.

The current tenants also maintain a burn pile for scrap wood and garbage generated at the Facility. These operations are limited to the southern half of the property. The northern half of the property is not currently used by the tenants and is vegetated with grasses and shrubs.

Waste from clandestine dumping at the Facility is scattered across the property and includes various wood waste, automotive batteries, barrels, and a cab from a tractor. There are numerous barrels and bins that contain, or once contained, agricultural oils used for biofuels production by the current tenants. A survey of the barrels did not indicate that chemicals other than agricultural oils were present.

Based on an interview with the previous wood treatment operator, the historical wood treatment operation had a dip tank that was located in the west-central part of the Facility (Seyler and Janssen 2015). Logs treated with the mixture of PCP and diesel were transferred to a drying area in the eastern part of the property, where they were placed on the ground to dry. The drying area is similar to the location now used to stack logs for the mill. **Figure 3 (Appendix A)** shows the location of the historical treatment and drying areas.

2.3.1.2 Chemical Handling and Storage

Currently, the primary chemical handling at the Facility is related to biofuels production and maintenance of the wood mill and vehicles. During the 2016 and 2017 site investigations, drums that contained liquids were generally observed to be placed on wooden pallets. However, the whole Facility is unpaved, so all spills have the potential to infiltrate into soil. During the 2016 and 2017 site investigations, the current site tenant was observed using automotive solvents and oils to work on the tractor-trailer.

Two shipping containers at the Facility are owned by the current tenant. The contents of these containers were not investigated, so it is not known if they are used for chemical storage.

2.3.1.3 Utilities

Utilities in the area are shown in **Figure 3 (Appendix A)** and are as follows:

- An aboveground power line runs east to west along the southern property line. No other utilities are present. Power to the camper trailer is provided by an extension cord that extends from the adjacent property.
- No buried utilities are present on the east side of Marcella Avenue adjacent to the Facility. Buried telecommunication lines are present on the west site of Marcella Ave on the Weeden Ranch property.
- During the initial site investigation in 2016, there was concern that a buried gas line existed at the Facility and had been connected to the historical PCP-diesel dip tank. The utility locator indicated that the closest gas line terminated 500 feet south of the Facility along Marcella Avenue. No evidence for a buried gas line was found during the 2016 and 2017 investigations.

2.3.1.4 Other Features

The Facility is a former landfill used by the City of Lewistown. The landfill ceased operation during the mid-1960s. The landfill was capped once shortly after closure with 2 feet of clay and again in the 1990s with 2 feet of street sweepings (fine sands to gravels). The site continued to be used for clandestine dumping after closure.

None of the following types of features is known to currently exist or been known to exist at the Facility in the past:

- Drains or sumps;
- Wastewater sources;
- Railroad lines or spur lines;
- Irrigation ditches;
- Surface impoundments;
- Surface water intakes;
- Facility process units or loading docks;
- Underground tanks and associated piping
- Water cooling systems and/or refrigeration units; or
- Water recovery sumps

2.3.1.5 Contiguous Property Features

Table 2.3-1 presents a description of contiguous properties to the Facility.

Table 2.3-1. Contiguous Properties

Direction from Facility	Contiguous Property Description
North & East	Shadow Estates followed by Judith Shadows Golf Course. The property directly north of the Facility (Shadow Estates) has been subdivided for residential parcels. The parcels are approximately 1 acre. The owner is believed to be the same individual who owns the Judith Shadows Golf Course. As of February 2017, no homes had been built at any of the parcels. The area is accessed from a gated dirt road off Marcella Avenue directly north of the Facility. Judith Shadows Golf Course is a privately owned 18-hole golf course located 850 feet north and northeast of the Facility. The clubhouse is located 3,500 feet to the northeast.
South	Kodiak Concrete operates a concrete, gravel, and quarry operation directly south of the Facility.
Southwest	City property located southwest of the Facility is used for staging and burning of green waste such as trees, shrubs, and clippings.
West	Agricultural rangeland operated by the Weeden Ranch is located west of the Facility.

2.3.2 Regulated Facilities

This section presents the results of an Environmental Data Resources, Inc. (EDR) federal and state regulatory databases search. Information summarized in this section was obtained by reviewing EDR's Radius Map Report (EDR 2017; **Appendix F**). Three regulated sites were identified within ¼-mile of the Facility. **Table 2.3-2** presents a summary of the sites.

Table 2.3-2. Regulated Sites within ¼-Mile of Facility

Regulated Site	Regulatory List(s)	EDR Map & Page #	Distance & Direction from the Facility	Apparent Hydraulic Gradient from the Facility
Kodiak Concrete 401 Marcella Avenue Mine ID# 2402337	Abandoned Mines	Map# 1 Page 8	0.057 mile (299 feet) to south of Facility	Upgradient
Central Post and Treating Co. ¼-mile NE on Marcella Avenue (No address)	SHWS DEL SHWS Remediation Program	Map# 2 Page 8	Facility	--
Bridgeford Industries	US Mines	Map# 3 Page 9	0.167 mile (881 feet) to south of Facility	Upgradient

SHWS – Solid Hazardous Waste Sites (CERCLA – state equivalent to CERCLIS)
DEL SHWS – Delisted solid and hazardous waste site
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS – Comprehensive Environmental Response, Compensation, and Liability Information System

Kodiak Concrete/Bridgeford Industries

The EDR report for Kodiak Concrete indicates the controller's name as Joseph Bridgeford and the Bridgeford Industries listing indicates the entity name as "Kodiak Site." As such, these two sites are likely the same. Tetra Tech searched the DEQ on-line database and abandoned mine list, the U.S. Environmental Protection Agency (EPA) Envirofacts on-line database, and the DEQ open cut permit list on April 13, 2017, for information about Kodiak Concrete and Bridgeford Industries. DEQ's Opencut Permits lists the operator as "Bridgeford Industries Inc Kodiak Concrete" and the site name listed as "Kolar" with permit number 1855. The actual permit lists the operator as "Bridgeford industries Inc dba Kodiak Concrete" and the site name as "Kolar Pit." However, based on township, range and section information in permit 1855, the location of this open cut mine is not near the Facility. The listings in Table 2.3-2 may or may not be related to the gravel pits adjoining the Facility. Information provided in EDR's report regarding Bridgeford Industries indicated the mine status as intermittent and noted multiple $100 citations between 2008 and 2015 with action type listed as 104(a). Information on the basis of the citations is not provided in the EDR report.

Central Post and Treating Co (CPTC)

Appendix E includes DEQ's site summary for CPTC. The site summary indicates the Facility is a former city dump where wood treating occurred from 1968 to 1973. Wood posts were treated with a mixture of PCP and diesel. After treatment, the posts were stacked on the ground to dry. Montana Department of Health and Environmental Sciences (MDHES; now DEQ) listed the site under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA subsequently declared the Facility as "No Further Action" under CERCLA. MDHES's 1989 visit to the Facility found no visible evidence of contamination. EPA's Emergency Response Branch also indicated no evidence of wood treating contamination during a site visit in 1991 but did note the Facility was used as a dump for asphalt disposal. MDHES's Solid Waste Program subsequently provided oversight during dump reclamation that included placing the soil cover and re-grading the dump's surface. The Facility is currently ranked as a low-priority CECRA facility.

2.3.3 Physical Environment

2.3.3.1 Climate

The climate of the Fergus County area is characterized by primarily cold, dry winters, with the mountains having cold, wet winters (U.S. Geological Survey [USGS] 1987). Springs are generally cool and moist, summers are dry, and falls are cool and dry. **Table 2.3-3** presents a summary of precipitation data collected between 1896 and 2016 (WRCC 2017a). The table also presents wind speeds collected between 1996 and 2006 (WRCC 2017b) recorded at the weather station located at the Missoula County Airport. Prevailing winds are from the west but, depending on the weather, could come from any direction. **Appendix F** includes copies of climate database information.

2.3.3.2 Topography

Tetra Tech reviewed the USGS topographic map available through DEQ's on-line mapping database. The topographic map indicates the elevation of the Facility is approximately 4,000 feet above mean sea level (amsl). The Facility adjoins, or is within, the Breed Creek drainage. The drainage trends from east to west in the Facility area. The map indicates multiple gravel pits within an approximately 2-mile radius. Residential properties and a park appear southwest of the Facility. Terraces that rise to elevations between 4,100 to 4,300 feet amsl like to the north and south. Topography of the Facility is presented in **Figure 4 (Appendix A)**.

Table 2.3-3.Climate Summary for Lewistown MUNI AP, Montana (244985)

Climate Feature	Average Minimum	Average Maximum	Annual Average
Temperature - Maximum (^{0}F)	32.2 (January)	81.4 (July)	55.7
Temperature – Minimum (^{0}F)	9.9 (January)	49.7 (July)	29.6
Precipitation – Total (in.)	0.63 (February)	3.52 (June)	17.67
Snowfall – Total (in.)	0.0 (July, August)	11.0 (January)	62.8
Wind Speed (mph)	7.9 (July)	10.7 / 10.6 (December, January)	9.5

^{0}F – degrees Fahrenheit
in. – inches
mph – miles per hour

2.3.3.3 Geologic and Hydrogeologic Characteristics

REGIONAL GEOLOGY

Fergus County lies in the area between the Rocky Mountains and Great Plains. The plains are contrasted by the low-profile Big Snowy, Little Snowy, Moccasin, and Judith Mountains. Over the past hundreds of millions of years, Montana was inundated by seas multiple times. These seas resulted in sediment accumulations of sand, mud, and lime thousands of feet thick. As these deposits compacted, cemented, and hardened over time, they became shale, sandstone, and limestone (Juvan 1988). Geologic forces caused some of the sediment to tilt or dip away from horizontal, resulting in uplift, folding, and faulting of some of the units, followed by erosion. The Fergus County area is characterized by relatively flat-lying sedimentary rocks, which have been modified through stream erosion (USGS 1987).

Cretaceous period sandstones and shales deposited in shallow seawater are overlain by unconsolidated Quaternary alluvium. The alluvium consists primarily of clay, silt, sand, and gravel deposited in stream valleys and as terrace gravels in benches (USGS 1987). Quaternary deposits range from 5 to 50 feet thick, with the thickest deposits along major drainage areas (Juvan 1988). These units dominate the valley floor in the Lewistown area. Tertiary period strata were eroded, with the exception of some gravelly terrace remnants bordering the Big and Little Snowy Mountains that extend for miles and are more than 50 feet thick in some locations.

The Big Snowy Mountains and Little Snowy Mountains are south of Lewiston. The mountains are a low-profile arch composed primarily of Paleozoic era Madison limestone and dolomite deposited approximately 300 million years ago in shallow seawater (Alt and Hyndman 1986). The Big Snowy Group is made up of shale, limestone, and sandstone. It overlies the eroded surface of the Madison Formation (USGS 1987). The Big and Little Snowy Mountains were uplifted by vertical forces then underwent erosion during the Triassic period (Juvan 1988). The northern margin of the Big Snowy Mountains are composed of Jurassic period shales. Both the Madison limestone and Jurassic shales of these mountains contain fossils.

The Moccasin Mountains (North Moccasin Butte and South Moccasin Butte) are north of Lewiston. The Judith Mountains are east and northeast of Lewiston. The Buttes and Judith Mountains are composed of clusters of igneous feldspar-rich granitic, syenite, and leucite intrusions emplaced during the Tertiary period, between 50 and 60 million years ago (Alt and Hyndman 1986). Other possible intrusions east of Lewistown appear as domed sedimentary rock that still may cap the intrusions.

Coal fields are also present in the region and primarily occur as late Jurassic period deposits. As a result of erosion that occurred during the Jurassic period, the mineable coal horizon is not continuous (USGS 1987). There are several mineable coal deposits in central Montana, including the Lewistown coal field (Buffalo Creek district). The Buffalo Creek District contains 2.5 to 4 feet of mineable coal.

LOCAL GEOLOGY

The primary soil types present in the Lewistown area include (USGS 1987):

Mollisols –

- The first type of mollisol soils occur on nearly level to steep slopes on fans, benches, and terraces. Parent material includes alluvium, sandstone, argillite, and quartzite. Soil depth ranges from 10 to 60 inches below ground surface (bgs).
- The second type of mollisol soils occur on moderately sloping to steep slopes on the foothills. Parent material includes alluvium and shales. Soil depth ranges from 10 to 40 inches bgs.
- The third type of mollisol soils is found on nearly level to steep slopes on fans, benches, and terraces. Parent material includes alluvium and sandstones. Soil depth ranges from 20 to 40 inches bgs.

Mollisols-Entisols – Mollisols-Entisols soils occur on moderately sloping to steep soils on foothills. Parent material includes alluvium and shale. Soil depth ranges from 20 to 40 inches bgs.

The Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) was searched for well logs in the Facility area. Lithologic logs for wells in the Facility area indicate lithology that ranges from interbedded shale, clay, gravel, sand, limestone, and coal to over 600 feet bgs to interbedded of clay and shale.

Native materials encountered during the installation of wells at the Facility indicate Quaternary alluvial sands and gravels overlying clays, weathered shale (mudstone), and more competent shale. The clays, weathered shale, and shale may represent the Colorado Group. The total depth of borings completed at the Facility ranges from 38 to 65 feet bgs. **Appendix J** includes copies of lithologic logs for wells installed at the Facility.

REGIONAL HYDROGEOLOGY

The primary regional aquifers used in the Fergus County area include Quaternary deposits, Eagle Sandstone, and Kootenai Formation. Mixtures of sand and gravel from primarily Quaternary alluvium and terrace deposits produce water in sufficient quantity to supply most domestic and livestock needs, with alluvium near streams supplying enough water for some irrigation use (USGS 1987).

Cretaceous and Jurassic sedimentary rocks underlie the Quaternary deposits. These sedimentary rocks are composed of a sequence of alternating shale and sandstone beds (USGS 1987). The Eagle Sandstone consists of friable sandstone interbedded with shale and thin coal seams. This formation can produce enough water for domestic and livestock needs. Extensive sandstone layers in the formation may produce water at rates of up to 70 gallons per minute (gpm).

The upper portion of the Colorado Group is composed of shale. However, the lower portion of the group consists of a fine-grained sandstone and a discontinuous sandstone bed that produce enough water for domestic and livestock needs (USGS 1987).

The base unit of the Kootenai Formation consists of thick, cross-bedded, fine- to coarse-grained, moderately permeable sandstone to fine-to coarse-grained, water-bearing sandstone lenses. These units are used heavily for domestic and livestock water supplies, with some areas producing enough water for municipal water supply (USGS 1987). The Kootenai Formation dips steeply away from the mountain fronts in a north-northeast direction. As such, drilling depths increase quickly away from the mountain margins.

Other units considered viable as aquifers include the Swift Formation (upper part of the Ellis Group) and the Madison Group limestones and dolomites. The Madison Group may also have the potential to yield large quantities of artesian water (USGS 1987).

Groundwater flow direction is generally to the north and east. Area-wide recharge is primarily from infiltration of precipitation. However, other sources may include infiltration from stream flow, inter-aquifer connectivity, and subsurface flow from the surrounding areas (USGS 1987). Recharge areas for the Madison Group, Kootenai Formation, are from the Little Belt and Big and Little Snowy Mountains (USGS 1987). Recharge to the Eagle Sandstone is mainly from outcrop areas in the semiarid plains.

LOCAL HYDROGEOLOGY

The USGS (1987) geologic map covering Fergus County indicates the primary hydrogeologic aquifer units for the Lewistown area are Quaternary period terrace deposits, the Cretaceous period Kootenai aquifer and Colorado Confining Layer (basal sandstone aquifer), and the Jurassic period Morrison and Ellis Confining Layers, which include the Swift Formation aquifer (USGS 1987). General groundwater flow in the Lewistown area appears to be north to slightly northwest. Based on the USGS (1987) geologic map, the Quaternary terrace aquifer is on the western portion of Lewistown, encompassing the airport and surrounding area. The Kootenai aquifer covers much of the rest of the valley bottom within Lewistown and between Lewistown and the Big and Little Snowy Mountains to the south. The Colorado basal sandstone aquifer appears as a linear feature east of town and also coves the area between Lewistown and the Moccasin Mountains to the north and Judith Mountains to the northeast. The Morrison and Ellis Confining Layers (Swift Formation aquifer) reside along the big and Little Snowy Mountain margin.

Native materials encountered during the installation of wells at the Facility indicate Quaternary alluvial sands and gravels followed by clays and weathered shale. Water was encountered within and above the shale. The wells were completed in a weathered portion of the Thermopolis Formation of the Colorado Group (Colorado Confining Layer), based on hydrogeologic information for the area (Porter and Wilde 1993; USGS 1987).

Depth to water encountered during drilling of on-site wells ranged from 20 to 66 feet bgs, which is the first water-bearing unit. This unit is considered confined. Groundwater flow direction and gradient vary across the Facility **(Figure 5, Appendix A)**. Flow direction varies from north to northwest, with a gradient of between 0.063 and 0.111 foot per foot. The potentiometric surface for February 2017 is shown in **Figure 5 (Appendix A).**

2.3.3.4 Groundwater Monitoring and Water Supply Wells

The Facility does not have a water supply well. However, five groundwater monitoring wells (GW01, GW02, GW03, MW05, and MW06) were installed at the Facility in 2016 and 2017 as part of the CECRA investigation to evaluate potential impacts from Facility operations. **Figures 2** and **3 (Appendix A)** show the locations of these wells. **Table 2.3-4**, below, presents well construction details for the three on-site monitoring wells. Stahly Engineering & Associates of Lewistown, Montana, surveyed the location and measuring point elevation of the on-site groundwater monitoring wells.

Table 2.3-4. Facility Well Construction Details

Well Element	GW01	GW02	GW03	MW05	MW06
Date Completed	2/9/2016	2/11/2016	2/10/2016	10/06/2016	2/9/2017
Borehole Diameter (in)	8.5	8.5	8.5	8.5	8.5
Total Depth of Borehole (ft bgs)	51	69	25	43	38
Total Well Depth (ft bgs)	51	69	25	43	38
Surface Casing Diameter (in)	6	6	6	6	6
Surface Casing Material	Steel	Steel	Steel	Steel	Steel
Well Casing Diameter (in)	2	2	2	2	2
Well Casing Material	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well Screen Material	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC
Well Screen Slot Size (in)	0.020	0.020	0.020	0.020	0.020
Well Screen Interval (ft bgs)	41 - 51	59 - 69	15 - 25	23 - 43	28 - 38
Measuring Point Elevation (ft NAVD88)	4030.25	4025.71	3989.55	4024.78	3956.11
Northing Coordinate (NAD83)	47.07637284	47.07751248	47.07749908	47.07613041	47.07766
Easting Coordinate (NAD83)	109.407389922	109.407287089	109.406353831	109.406195064	109.408400000

ft – feet in – inches bgs – below ground surface
Sch – Schedule
PVC – Polyvinyl chloride
NAD83 – North American Datum, 1983
NAVD88 – North American Vertical Datum, 1988
Wells surveyed by Stahly Engineering & Associates

Table 2.3-5, below, presents the water table elevation data collected to date.

Table 2.3-5. Summary of Water Table Elevation Data

Well	Date	Static Water Level (ft btoc)	Water Table Elevation (ft NAVD88)
GW01	2/22/2016	35.18	3995.07
	6/6/2016	32.84	3997.41
	10/27/2016	36.5	3993.75
	2/13/2017	34.23	3996.02
GW02	2/22/2016	52.81	3972.9
	6/6/2016	48.37	3977.34
	10/27/2016	55.5	3970.21
	2/13/2017	58.26	3967.45
GW03	2/22/2016	14.84	3974.71
	6/6/2016	12.9	3976.65
	10/27/2016	16.85	3972.7
	2/13/2017	14.69	3974.86
MW05	10/27/2016	26.71	4024.78
	2/13/2017	28.32	3996.46
MW06	2/9/2017	17.72	3938.39

ft – feet
btoc – below top of casing
NAVD88 – North American Vertical Datum, 1988

2.3.3.5 Surface Water

The closest surface water body to the Facility is Breed Creek, approximately 500 feet northwest. Breed Creek is a tributary of Big Spring Creek, which converges with Judith River north of Lewistown (see Section 2.5). Breed Creek is a meandering stream that flows generally from east to west through the area. Ponded areas along Breed Creek to the northeast and east of the Facility may be related to small dams along the creek and used to irrigate adjoining agricultural fields. Several other small reservoirs along tributary streams to Breed Creek are approximately 1 mile northeast of the Facility. The floodplain along Breed Creek may support some wetland vegetation. No other irrigation ditches or surface water features were identified during work at the Facility.

Tetra Tech reviewed the Flood Insurance Rate Map (30027C1883D), dated July 22, 2010 (Federal Emergency Management Agency [FEMA] 2017), that provides coverage of the Facility area. The map shows the Facility is outside the floodplain of Breed Creek.

2.3.3.6 Storm Water and Wastewater

There are no sources of wastewater discharges at the Facility. The surface of the landfill is relatively flat. Precipitation primarily infiltrates into the subsurface. However, storm water runoff from the edges of the landfill surface and landfill slopes is expected and would migrate toward adjoining properties. Borrow ditches adjoin Marcella Avenue and the unnamed road on the east. Storm water runoff at the Facility would primarily move toward the north.

2.3.3.7 Aquatic and Terrestrial Habitats

The Facility consists of disturbed grassland adjacent to agricultural, rangeland, industrial, and residential areas. The Montana Animal Species of Concern Report prepared by the Montana Natural Heritage Program and Montana Fish, Wildlife and Parks (Montana Natural Heritage Program [MNHP] 2017) documented 16 species of concern occurring within 10 miles of the Facility. None of these species is known to occur in developed areas such as the Facility, as these types of environments do not provide suitable habitat. Furthermore, the list includes fish that only have the potential to occur off site and some waterbirds that are unlikely to occur at the Facility. There are no known plant species of concern at or near the Facility (MNHP 2017).

There is no on-site water body, and groundwater is too deep for ecological receptors to be exposed. Although there is a riparian area within one-quarter mile of the Facility, no impacts to that area are anticipated based on the nature and extent of contamination at the Facility. Therefore, the aquatic species of concern listed below are not considered to be present at, or impacted by, the Facility. **Table 2.3-6** presents a list of the species of concern within 10 miles of the Facility.

Table 2.3-6. Montana Wildlife Species of Concern Documented within 10 Miles of Facility

Scientific Name	Common Name	Family	Habitat
Lasiurus cinereus	Hoary Bat	Bats	Riparian and forest
Corynorhinus townsendii	Townsend's Big-eared Bat	Bats	Caves in forested habitat
Myotis lucifugus	Little Brown Myotis	Bats	Generalist
Accipiter gentilis	Northern Goshawk	Hawks / Kites / Eagles	Mixed conifer forests
Botaurus lentiginosus	American Bittern	Bitterns / Egrets / Herons / Night-Herons	Wetlands
Ardea herodias	Great Blue Heron	Bitterns / Egrets / Herons / Night-Herons	Riparian forest
Numenius americanus	Long-billed Curlew	Sandpipers	Grasslands
Dolichonyx oryzivorus	Bobolink	Blackbirds	Moist grasslands
Anthus spragueii	Sprague's Pipit	Pipits	Grasslands
Catharus fuscescens	Veery	Thrushes	Riparian forest
Nucifraga columbiana	Clark's Nutcracker	Jays / Crows / Magpies	Conifer forest
Chrosomus eos	Northern Redbelly Dace	Minnows	Small prairie rivers
Sander canadensis	Sauger	Perches	Large prairie rivers
Oncorhynchus clarkii lewisi	Westslope Cutthroat Trout	Trout	Mountain streams, rivers, lakes
Oreohelix strigosa berryi	Berry's Mountainsnail	Mountain Snails	Limestone talus

2.3.3.8 Sensitive Environments

The Administrative Rules of Montana (ARM) 17.55.102 defines sensitive environmental to include terrestrial or aquatic resources including wetlands, with unique or highly valued environmental or cultural features; an area with unique or highly valued environmental or cultural features; or a fragile natural setting. The Facility has some undeveloped areas that may represent some form of ecological habitat; however, no ecological receptors are expected to require the use of the Facility, as primary habitat and the site does not provide critical habitat for endangered or sensitive species.

2.4 AREA WELLS

Section 75-10-734(2)(c), MCA, requires VCP documentation to include the location of any wells located on the Facility or on areas within a ½-mile radius of the Facility, including a description of the use of those wells. The Facility is located in the NW¼ of NW¼ of SE¼ of Section 11, Township 15 North, Range 18 East. Three approaches were used to identify wells in the area, including:

- Tetra Tech search of the GWIC database;
- Tetra Tech interview of Susan L. Baldwin, Sanitarian for Central Montana (Personal Communication, Tetra Tech 2017b);
- Tetra Tech interview of Holly Phelps, City Manager for the City of Lewistown (Personal Communication, Tetra Tech 2017c);
- Tetra Tech field survey of the Facility area (½-mile radius).

2.4.1 GWIC Database Search

Tetra Tech searched the GWIC (MBMG 2017) database for wells within a ½-mile radius of the Facility. This search identified 13 wells in the Facility area (not including Facility monitoring wells). Uses specified for the 13 wells include domestic, industrial, irrigation, monitoring, and stockwater. **Appendix G** includes copies of available well logs. **Figure 6 (Appendix A)** presents the approximate location of wells identified in the search area. Note that GWIC well locations are approximate and are based on descriptions provided in the well logs that may be either inaccurate or have low accuracy.

Tetra Tech installed five groundwater monitoring wells; however, only the three wells installed in February 2016 were listed in the GWIC database. These include monitoring wells GW01 (GWIC# 286316), GW02 (GWIC# 286319), and GW03 (GWIC# 286320). The five on-site wells include:

- GW01: Well cross-gradient from primary contaminated area;
- GW02: Well down-gradient of contaminated area at northwest corner of landfill;
- GW03: Well down-gradient of contaminated area on the northeast side of landfill;
- MW05: Well most upgradient of the Facility, located on Kodiak Property to the south of the historical landfill;
- MW06: Well down-gradient of the Facility, along primary groundwater flow path towards Breed Creek.

Well MW05 was installed in September 2016 based on a concern that water infiltrating along the southern property line at the Facility may migrate to the south rather than to the north. This concern was based on local topography, and the extensive excavation and dewatering operations at quarries southeast of the Facility. Well MW06 was installed in February 2017 to intercept groundwater flowing from the Facility toward Breed Creek. *Note: No monitoring well MW/GW04 exists at the Facility.*

Table 2.4-1 lists cross-gradient and down-gradient wells closest to the Facility found in the GWIC database.

Table 2.4-1. Nearest Cross-Gradient and Down-gradient Wells Identified in GWIC

GWIC Well ID#	Listed Owner	Approximate Distance & Direction from Facility	Hydraulic Gradient From Facility	Listed Use
26853	Eldred Bauman	971 feet to west-southwest	Cross-gradient	Domestic
150511	Judith Shadows Golf Course	1,000 feet to north-northeast	Cross-gradient	Irrigation
30694	J C McDonald	1,236 feet to west	Cross-gradient	Domestic
1937	James Wilkins	1,672 feet to northeast	Cross-Gradient	Stockwater
26851	Tom Affly	215 feet to west	Cross-gradient to Down-gradient	Unknown
210895	Judith Shadows Golf Course	215 feet to north	Down-gradient	Irrigation

2.4.2 Interviews

Tetra Tech interviewed the following individuals on April 6 and 7, 2017, to obtain additional information about wells in the area:

- Holly Phelps, City Manager for the City of Lewistown (Tetra Tech 2017c);
- Susan Baldwin, Sanitarian for Central Montana (Tetra Tech 2017b);
- Ray Besel, local environmental contractor and resident familiar with the area (Tetra Tech 2017d).

The interviewees did not identify any additional wells or groundwater concerns in the area.

2.4.3 Neighborhood Well Survey

Tetra Tech performed a reconnaissance of the area for potential water supply wells within ½-mile of the Facility. Tetra Tech conducted the reconnaissance from public rights-of-way by walking all public roads in the area and documenting the location of any structure, wellhead, or exposed pipe that may have been related to water supply. **Figure 6** includes the potential well locations and the search radius. **Table 2.4-2** lists the wells or possible wells identified during reconnaissance of the area. Field personnel identified 18 potential wells in the Facility area. None of the wells was down-gradient of the Facility. Some of these wells may also be listed on the GWIC list. **Appendix G** includes the well survey field notes and photograph log.

Table 2.4-2. Neighborhood Well Survey Results

Tetra Tech Survey ID	Address	Approximate Distance & Direction from Facility	Hydraulic Gradient From Facility
001	North of Rifle Range Road	2,300 feet to northeast	Cross-Gradient
002	37 Apple Blossom Lane	1,000 feet to south	Upgradient
003	Eastern most property on Apple Blossom Lane	1,100 feet to south	Upgradient
004	South of Apple Blossom Ln.	1,000 feet to south	Upgradient
005	West of Marcella Ave.	1,960 feet to south	Upgradient
006	West of Marcella Ave.	1,900 feet to south	Upgradient
007	58 Apple Blossom Ln.	1,100 feet to south	Upgradient
008	415 Boyd Ave.	1,400 feet to southwest	Upgradient
013	340 NE Boulevard St.	1,600 feet to southwest	Upgradient
014	334 NE Boulevard St.	1,700 feet to southwest	Upgradient
015	15 feet west of Prospect Ave.	2000 feet to southwest	Upgradient
016	20 ft east of Boyd Ave.	2000 feet to southwest	Upgradient
017	307 Prospect Ave.	2000 feet to southwest	Upgradient
018	528 NE Broadway Street	1,900 feet to southwest	Upgradient
019	640 Broadway St.	1,600 feet to south	Upgradient
020	620 NE Main St.	1,700 feet to south	Upgradient
021	South of Broadway St.	1,700 feet to south	Upgradient
022	218 Boulevard St.	2,39 feet to southwest	Upgradient

2.5 GROUNDWATER AND SURFACE WATER USAGE

Section 75-10-734(2)(d) MCA requires the VCP to include the current and reasonably anticipated future use of groundwater and surface water at the Facility. These uses are based on the following:

- Suitability of water for beneficial uses;
- Historical land and water uses;
- Anticipated future land and water uses;
- Regional and local development patterns;
- Regional and local population projections; and
- Availability of alternate water sources including, but not limited to, public water supplies, groundwater sources, surface water sources; and community and nearby property owners' concerns regarding future water use.

2.5.1 Groundwater

Big Spring is the world's third-largest freshwater spring and is the source of water for Big Spring Creek. Holly Phelps (City Manager for Lewistown; April 11, 2017) stated that Big Spring is the only source of municipal water supply for the residents of Lewistown. The spring, located 6 miles south of Lewistown at the foothills between Judith and Big Snowy Mountains, is fed into a pipeline and distributed to residents.

The water originates as an artesian spring from the Madison limestone formation. The spring flows at a rate of 50,000 to 64,000 gpm; up to approximately 92 million gallons per day. The water currently does not require treatment prior to use.

Tetra Tech contacted Lewistown City Manager (Holly Phelps), the planning director for Fergus County (Pamela Vosen), and the Sanitarian for Fergus County (Susan Baldwin) to inquire about any other zoning, ordinances, and planning documents that may cover the Facility and adjoining area, or that may govern groundwater wells and water use. Each stated that no other city or county documents cover the Facility or the adjoining area for land or water use.

Groundwater for the Lewistown area is generally within the Kootenai Formation. Specific conductance measured in the Kootenai Formation in groundwater from wells in the Lewistown area (Judith drainage basin) ranged from 273 to 1,250 microSiemens per centimeter (µS/cm) at 25 degrees Celsius (°C) (USGS 1985). This groundwater would be considered Class I according to ARM 17.30.1006 because the specific conductance is less than or equal to 1,000 µS/cm at 25°C.

Facility wells are likely completed in the Thermopolis shale. Specific conductance measured in groundwater collected from monitoring wells at the Facility ranged from 587 to 3,902 µS/cm, with wells GW-02 and GW-03 exhibiting the highest specific conductance. Based on the site-specific measurements, groundwater at the Facility would be considered Class I to Class III according to ARM 1730.1006. Class II groundwaters are those with a specific conductance greater than 1,000 µS/cm at 25°C and less than or equal to 2,500 µS/cm at 25°C, and Class III groundwaters 2,500 and less than or equal to 15,00 µS/cm at 25°C.

Class I groundwaters are suitable for public and private water supplies, culinary and food processing, crop irrigation, drinking water for livestock and wildlife, and commercial and industrial purposes. Class II groundwaters have the same uses as Class I but include an exception that they are suitable for some crop irrigation and most commercial and industrial purposes. Class III groundwaters are suitable for irrigation of some salt-tolerant crops, some commercial and industrial purposes, as drinking water for some livestock and wildlife, and drinking, culinary, and food processing where specific conductance is less than 7,000 µS/cm at 25°C.

2.5.2 Surface Water

Lewistown lies within the Big Spring Creek watershed, which is part of the Lower Missouri River Basin. Big Spring Creek is the largest creek in the Lewistown area. The creek begins at Big Spring, an artesian spring originating in the Madison limestone formation, located 6 miles south of Lewistown in the foothills between the Judith and Big Snowy Mountains. Other small tributary streams also feed into Big Spring Creek within the basin, such as Cottonwood Creek and Little Casino Creek that flow north from the southern portion of the drainage; and Boyd Creek and Breed Creek that flow west from the eastern portion of the drainage. From its source, Big Spring Creek flows approximately 26 miles before converging with Judith River within the Judith River drainage basin, northwest of Lewistown. Big Spring Creek is a highly productive trout stream.

The Judith River converges with the Missouri River at the border of Fergus County with Chouteau County, approximately 30 miles north of the convergence with Big Spring Creek. Tetra Tech reviewed ARM 17.30.610 for the Missouri River Drainage to evaluate stream classifications for the area. Big Spring Creek is in the Big Springs Total Maximum Daily Load (TMDL) Planning Area. It is listed as Category 4A on Montana’s Clean Water Act Sections 305(b) / 303(d) stream list. Category 4A states that *“All TMDLs required to mitigate identified impairments or threats have been completed and approved.”*

Big Spring Creek is also has a B-1 stream classification. Judith River and the Missouri River are classified as follows:

- Judith River drainage except waters listed in ARM 17.30.610 (1)(e)(iii)(A) through (D) – B-1 stream classification.
- Judith River (mainstem) from Big Spring Creek to the Missouri River – B-2 stream classification.
- Missouri River from convergence of Marias River to Fort Peck Reservoir – B-3 stream classification.

B-1, B-2, and B-3 classifications state that waters are to be:

> *"…maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply."*

Recreationists frequently fish, swim, and boat on these streams and rivers, and water is drawn from the streams and rivers for livestock and irrigation. The surface water uses of these streams and of other surface water bodies at and near the Facility are not expected to change in the future, and violations of water quality standards are not allowed. ARM 17.30.623, ARM 17.30.624, and ARM 17.30.625 provide additional details.

2.6 OPERATIONAL HISTORY OF FACILITY

The following sections present the historical ownership and records reviews for the Facility. These sections also discuss the Facility's past and current operational history.

2.6.1 Historical Ownership Review

The City of Lewistown provided Tetra Tech with a copy of the only known property record for the Facility. **Appendix E** provides a copy of the 1960 Warranty Deed for the property located at:

S ½ SE ¼ NE ¼ of Section 2 in Township 15 North, Range 18 East.

As discussed in Section 2.2.1, this deed (on file with the City of Lewistown's engineer's office) does not appear to pertain to the Facility, as the Facility is located in Section 11 and is a 6-acre property. The deed on file indicates the property is 20 acres.

2.6.2 Historical Records Reviews

2.6.2.1 City Directories

Tetra Tech reviewed city directory listings provided by EDR for Marcella Avenue. The directories include Cole Information Services listings for 1992 to 2013 and Polk's City Directories listings for 1963 to 1988. **Appendix E** includes a copy of the EDR city directory search (EDR 2017).

Most of the listings appear to be residential based on the listing of first and last names. These listing appeared to be for addresses south of the Facility, with the closest residence approximately 650 feet south (based on a search of the address on Google Earth). **Table 2.6-1** provides a list of the business names identified in the city directory search. No listings identified the Facility.

Table 2.6-1. City Directory Summary of Business Listings

Year	Listing	City Directory Business Listing / Description of Services
1999	112 Marcella Avenue	Hi Technology Electronics Oral & Maxillofacial Surgeon
1988	End (of Marcella Ave.)	Jim's Ready Mix
1984	End (of Marcella Ave.)	Jim's Ready Mix Haider Construction Co.
1979	End (of Marcella Ave.)	Jim's Ready Mix Haider Construction Co., general building contractors
1974	End (of Marcella Ave.)	McDonald Ready Mix Concrete Haider Construction
1969	End (of Marcella Ave.)	McDonald Ready Mix Concrete
1963	End (of Marcella Ave.)	McDonald Jos C

2.6.2.2 Sanborn Fire Insurance Maps

The Sanborn Company began preparing maps for fire insurance companies in the late nineteenth century. These maps indicate the construction materials of specific structures in developed urban areas. The fire insurance maps were updated and expanded geographically and periodically through the twentieth century, until around 1956. EDR (2017) searched its Sanborn Fire Insurance Map repository but found no coverage for the Facility and surrounding area. Historically, this area of Lewistown was not within the main urban area and likely had limited development; as such, maps were likely not produced for the Facility area.

2.6.2.3 Topographic Maps

EDR's report (EDR 2017) provided copies of reasonably available historical topographic maps (**Appendix E**) that provide coverage of the Facility and surrounding area. Topographic maps were available between 1941 and 2014. **Table 2.6-2** provides a summary of observations based on a review of the topographic maps.

No potential environmental conditions at or near the Facility were identified through the topographic map review other than the gravel pits and concrete business in the Facility area.

Table 2.6-2.Topographic Map Review Summary

Year	Topographic Map Description
1941	Marcella Avenue appears on the map. Four residences appear along the east side of the road. Much of the eastern portion of Lewiston appears similar in extent to its current condition. Breed Creek is shown on the map north and northwest of the Facility. Boyd Creek is shown on the north side of Highway 87, south of the Facility. A reservoir is shown northeast of the Facility.
1944	The topographic map appears relatively unchanged from the 1941 map.
1985	Residential development in the area south and southwest of the Facility has increased. Gravel pits are shown south and southeast of the Facility. Much of the remaining area surrounding the Facility appears relatively unchanged from the 1941 and 1944 maps.
2014	The area appears relatively unchanged from the 1985 topographic map. The map now shows Rifle Range Road at the north end of Marcella Avenue and Ready Mix Road located south of the Facility. The gravel pits are no longer labeled on the map. Much of the remaining area surrounding the Facility appears unchanged from the 1985 map.

2.6.2.4 Aerial Photographs

EDR's report (EDR 2017; **Appendix E**) provided reasonably available aerial photographs depicting development at and surrounding the Facility. Evaluation of the aerial photographs is controlled by photograph scale and quality. Historical aerial photographs were available between 1953 and 2011 through EDR. The 2014 aerial photograph was available through Google Earth. **Table 2.6-3** presents a summary of observations based on a review of the aerial photographs.

No potential environmental conditions at or near the Facility were identified through review of the topographic map review other than soil disturbance at the Facility and the gravel pits in the Facility area.

Table 2.6-3. Aerial Photograph Review Summary

Year	Aerial Photograph Description
1953	Soil disturbance appears on the property adjoining on the south and across Marcella Avenue to the southwest (likely disturbance related to the gravel pits). Some disturbance or objects appear on the northwestern portion of the Facility. Agricultural crops appear on properties to the north, west, east, and southeast of the Facility. It also appears the area of the Facility was a former stream channel or ravine based on agricultural crop boundaries and possible relief noted in the photograph. Residential homes appear to the south and southwest of the Facility. A stream appears to the north of the Facility.
1975	Soil disturbance on the property to the south appears to have expanded to the south and east, and additional soil disturbance appears on the property to the southwest. Possible soil disturbance appears at the Facility. The remaining area appears relatively unchanged from the 1953 aerial photograph.
1982	The aerial photograph is of poor quality. Soil disturbance at the Facility appears to have increased, and soil disturbance on the property to the south has increased again to the south and east. Similar soil disturbance to that in the 1975 photograph is present on the property to the southwest, across Marcella Avenue. The remaining area appears relatively unchanged from the 1975 photograph.
1991	Soil disturbance at the Facility and the properties to the southwest and south all appear to have decreased. The remaining area appears relatively unchanged from the previous aerial photographs.
1997	The aerial photograph is of poor quality. Possible soil disturbance appears at the Facility as two long linear lines, a northwest to southeast line along the northeastern boundary and another northwest to southeast line through the central portion. Soil disturbance was also present west of the Facility across Marcella Avenue with soil disturbance and disturbance from vehicles observed on the properties to the south and southwest.
2005	The two linear lines on the Facility are no longer present, but some soil disturbance or area of limited vegetation appears on the eastern portion of the Facility. Soil disturbance to the west appears to have partially recovered with vegetation as well as some of the areas for the properties south and southwest of the Facility. Structures now appear on the properties to the south and southwest. The remaining area appears relatively unchanged from prior photographs.
2006	Greater soil disturbance appears again at the Facility and on the properties to the south and southwest. The remaining area appears relatively unchanged from prior photographs.
2009	Soil disturbance at the Facility and properties to the south and southwest appear to have increased again. New roads appear to the north and northeast of the Facility. Cropland appears to the southeast in areas previously disturbed. The remaining area appears relatively unchanged from prior photographs.
2011	The Facility and surrounding area appear relatively unchanged from the 2009 photograph.
2014	The 2014 Google Earth image shows the Facility and surrounding area are relatively unchanged from the 2011 photograph.

2.6.2.5 Other Records

EDR Records

EDR (2017) searched for building permits, tax maps, environmental liens, and activity use limitations (AULs). Building permits and tax maps were not available within EDR's search resources. Environmental liens and AULs were searched through the Fergus County recorder of deeds, DEQ, and EPA. No environmental liens or AULs were identified for the property.

City of Lewistown – 1990 Meeting Notes

The City of Lewistown's engineer's office provided copies of meeting notes pertaining to the Facility. The meeting notes were possibly from May 1, 1990, but the date was not clearly legible. The notes mention "getting the Old City Dump covered up" because of a mandated requirement. The anticipated cost to cover the dump was $4,000 but there the notes mention that it could cost much more than $4,000. A follow up meeting was planned with the local health department and someone from Helena to obtain a "firmer anticipated cost."

City of Lewistown – April 15, 1991, Meeting Notes

City meeting notes that appear to be dated April 15, 1991, discuss "The Old City Dump." The notes discuss gullies that had been washed into parts of the dump and identify that weeds at the dump should be sprayed. The meeting notes indicate that meeting participants wanted to get the state to visit the Facility and "sign off" on the work that had been done.

City of Lewistown – August 6, 2010, Meeting Notes

These notes document discussions about an upcoming site visit to the dump by an EPA Solid Waste Division representative. The notes mention the following: a meeting at the dump with the EPA representative to discuss "mandated requirements,", the need to address noxious weed problems, and people dumping trees and rubbish along the road at the dump.

2.6.3 Past and Current Operational History of Facility

2.6.3.1 Past Operational History of Facility

The Facility formerly operated as the City of Lewiston municipal landfill. The landfill operated from the early 20th Century until disposal ceased in the 1960s (Tetra Tech 2016a). When disposal operations ceased, a clay cap was placed over the landfill waste. The city leased the property to Lyle "Bud" Smith from 1968 to 1973 for use as a post and pole wood treating operation. The operation included cutting the trees to size, peeling them, and then air-drying the posts. After they were dry, they were placed vertically into a cage then dipped into a heated mixture of diesel and PCP. Once treated, the posts were stacked on the ground and allowed to air-dry. Mr. Smith said he never spilled any of the wood treating mixture. He reported that the dipping operations caught fire in 1968 and had to be extinguished by the fire department (Seyler and Janssen 2015).

The landfill was officially closed in 1990. As part of the closure, the city spread 2 feet of street sweepings on the surface of the landfill as a cover.

2.6.3.2 Current Operation of Facility

Light vehicle traffic from the adjacent Marcella Avenue runs adjacent to the Facility, with most of the traffic related to residential access or commercial access to a nearby golf course. Traffic in the Facility area may increase with future residential development of the surrounding land. The current lessor of the property occupies an on-site trailer as a site office and part-time residence. The current operator stated that local youth may access the property late at night.

The property is currently used as a mill to manufacture wood posts and as a biofuels operation. The operation occupies the footprint of the former post and pole treatment area. The mill and biofuels operation uses multiple areas for staging transportation equipment and milling equipment, and an area is also use as a boneyard for industrial equipment and agricultural implements. Large bulk containers, drums, and pallets are stored on the south side of the property near the biofuels operation. These containers are located near the on-site trailer.

2.7 CURRENT AND FUTURE FACILITY USE

MCA 75-10-701(18) requires the VCP include the current and reasonably anticipated future uses of the Facility and adjoining properties. These future land uses consider:

1. Local land and resource use regulations, ordinances, restrictions, or covenants;
2. Historical and anticipated Facility uses;
3. Development patterns in the area; and
4. Relevant indications of anticipated land use from the Facility owner and local planning officials.

Tetra Tech reviewed the zoning map available on-line through the City of Lewistown's Planning and Grants department webpage (http://www.cityoflewistown.com/services/planning-community-development.html) on April 11, 2017. The map provides coverage for the residential properties southwest of the Facility but does not provide coverage for the Facility and adjoining area. The residential properties are zoned R1 (residential one family), R2 (residential two family), R3 (residential multi-family), and RMO (residential mobile home). Commercial zoning along Highway 87 was noted as C3 (highway commercial).

Tetra Tech also contacted the City Manager for Lewistown (Holly Phelps), the Planning Director for Fergus County (Pamela Vosen), and the Sanitarian for Fergus County (Susan Baldwin) to inquire about any other zoning, ordinances, and planning documents that may cover the Facility and adjoining area. Each stated that no other local documents cover the Facility.

The current use of the property appears to be light industrial as a wood post mill and biofuels company currently operates at the Facility. A portion of the property is used as a boneyard for heavy machinery (such as tractors) and storage of large to small containers, likely associated with the biofuels operation. The property is also used as a part-time residence for the operator of the company. Future use is expected to remain either as a vacant property or for light industrial use.

2.8 REGULATORY AND COMPLIANCE HISTORY

Section 75-10-734(2)(i), MCA, requires that the VCP include readily available information on the environmental regulatory and compliance history of the Facility, including permits.

2.8.1 Environmental Permits, Permit Violations and Notifications

Tetra Tech reviewed available City of Lewistown records for the Facility and conducted interviews on April 6 and 7, 2017, with:

- Holly Phelps, City Manager for the City of Lewistown (Tetra Tech 2017c);
- Susan Baldwin, Sanitarian for Central Montana (Tetra Tech 2017b);
- Ray Besel, local environmental contractor and resident familiar with the area (Tetra Tech 2017d).

Tetra Tech also reviewed data on DEQ's site summary for the Facility and search records provided by EDR (2017). There are no known environmental permits, permit violations, or notifications related to the Facility. DEQ currently lists the Facility as a low-priority CECRA facility.

2.8.2 Regulatory and Compliance Actions

EDR's (2017) search of regulatory databases found no environmental liens, AULs, or violation or compliance notifications for the Facility property. DEQ's site summary (**Appendix E**) for the Facility indicate that MDHES performed a CERCLA preliminary assessment in 1988. EPA subsequently declared the site as "No Further Action" under CERCLA. A 1989 site visit by MDHES under CECRA found no visible evidence of contamination, and a 1991 site visit by EPA indicated no evidence of wood treating contamination. City of Lewistown meeting notes from the 1990s (**Appendix E**) indicate that the city worked with the MDHES and possibly EPA in relation to closure of the landfill, including a requirement to place a 2-foot cover across the landfill surface. The dump was reclaimed by placing a soil cover and regrading the surface, which was completed under oversight by MDHES. The property was subsequently ranked as a low-priority CECRA facility.

2.8.3 Litigation

There is no known current or past litigation related to the Facility.

2.8.4 Controlled Allocation of Liability Act

In 1997, the Montana Legislature added the Controlled Allocation of Liability Act (CALA; Section 75-10-742 through 751, MCA) to the CECRA (Section 75-10-701 through 757, MCA), the state Superfund law. The Facility is currently not a CALA site.

2.9 FACILITY CHARACTERIZATION

This section describes the site investigation activities conducted at the Facility during 2016 and 2017 in relation to releases or potential releases of hazardous or deleterious substances.

This Facility Characterization section is organized as follows (in-text tables are not listed):

Facility Characterization Topic	Section Number	Location in VCP Appendix A Figure Number	Appendix B Table Number
DEQ Site Visit	Section 2.9.1	NA	NA
2016 Soil and Groundwater Investigation	Section 2.9.2	NA	NA
2016 and 2017 Supplemental Investigations	Section 2.9.3	NA	NA
Soil Sample Preparation	Section 2.9.4	NA	Table 1
Soil Screening Levels and Groundwater Standards	Section 2.9.5	NA	Tables 2 - 8
Data Quality Assurance/Quality Control	Section 2.9.6	NA	NA
Conceptual Site Model	Section 2.9.7	Figure 7	NA
Soil Investigations	Section 2.9.8	Figures 8 - 33	Tables 9 - 20
Groundwater Investigation	Section 2.9.9	NA	Tables 21 - 27

Notes: NA - not applicable.

2.9.1 2015 DEQ Site Visit

In 2015, DEQ initiated investigations of the Facility to evaluate the potential need for cleanup. The first phase of the investigation included a DEQ site visit with Lyle "Bud" Smith. Mr. Smith operated the former post and pole wood treating business on-site between 1968 and 1973. The wood treating operation included: peeling and cutting the trees to size to make the posts, air-drying the prepared wood, placing the posts vertically into a cage, dipping the posts into a heated mixture of diesel and PCP; stacking the treated posts on the ground to air dry.

During the 2015 site walk with Mr. Smith, he stated that he never spilled any of the wood treating mixture. However, he reported that the dipping operations caught fire in 1968 and had to be extinguished by the fire department (Seyler and Janssen 2015). The initial 2015 site visit identified areas of the Facility where the diesel-pentachlorophenol mixture had been used.

2.9.2 2016 Soil and Groundwater Investigation

In 2016, Tetra Tech and DEQ developed an initial site investigation plan for soil and groundwater to identify COPCs at the Facility (Tetra Tech 2016b). This initial investigation was completed between February and June 2016. The results are summarized in the Phase II Investigation Report (Tetra Tech 2016a).

The 2016 investigation plan was developed based on the findings from the 2015 DEQ site visit. The goal of the 2016 investigation was to identify the presence or absence of COPCs related to historical wood treatment and landfill operations by collecting soil and groundwater samples from the Facility for laboratory analysis. Specifically, current surface soils (composed of municipal street sweepings) and historical surface soils (landfill clay cap) were investigated for a suite of COPCs. In addition, three monitoring wells were installed to assess COPCs in groundwater. **Table 2.9-1** provides a list of analytical parameters and methods.

Table 2.9-1. Soil and Groundwater Analytical Parameters and Methods

Analytical Parameter	Soil Analytical Method	Groundwater Analytical Method
Volatile organic compounds (VOCs)	U.S. Environmental Protection Agency (EPA) Method 8260B	EPA Method 8260B
Semivolatile organic compounds (SVOCs)	EPA Method 8270D	EPA Method 8270D
Extractable Petroleum Hydrocarbons (EPH)	Montana Method EPH	Montana Method EPH
Volatile petroleum hydrocarbons (VPH)	Montana Method VPH	Montana Method VPH
Herbicides / Pesticides	EPA Method 8151A	EPA Method 8151A
Resource Conservation and Recovery Act (RCRA) 8 Metals	EPA Method 6010 EPA Method 7471B - mercury	EPA Method 6010 EPA Method 7470A – mercury *Note: 2017 groundwater analyzed by 6020 to achieve lower PQL for arsenic*
Polychlorinated dibenzo-p-dioxins (Dioxins) and Polychlorinated dibenzofurans (Furans)	EPA Method 8290	EPA Method 8290

In addition to laboratory analysis, the investigation included installing soil gas probes to evaluate the release of landfill gas and measuring surface soil thickness to evaluate the depth of the cap over the historical landfill. These results are presented in Section 2.9.8.1

2.9.3 2016 and 2017 Supplemental Investigations

Tetra Tech conducted two supplemental investigations in 2016 and 2017. First, Tetra Tech collected additional surface and subsurface soil samples in September and October 2016 to assess the extent of COPCs identified during the initial phase of the investigation (Tetra Tech 2016d). The investigation addressed the presence of COPCs in the historical landfill and adjacent properties through soil boring and composite surface soil sampling. One additional groundwater monitoring well (MW05) was installed to assess potential southward migration of contaminants.

Tetra Tech conducted the second supplemental investigation in February 2017 (Tetra Tech 2017a). The purpose of this investigation was to complete sampling to evaluate the extent of COPCs in surface soils at the Facility and install an additional groundwater monitoring well (MW06). The additional monitoring well was installed based on the September 2016 investigation which provided a better understanding of the native and historical landfill topography.

Analytical methods for the additional investigations generally were consistent with those specified in **Table 2.9-1**. The exception is that groundwater samples collected in February 2017 were analyzed for metals by EPA Method 6020 to achieve a lower practical quantitation limit (PQL) for arsenic.

2.9.4 Soil Sample Preparation

LEAD IN SOIL

Discussions with DEQ specified that the Facility is considered industrial/commercial and would not be used as a residential site in the future. Therefore, no soil samples for analysis of lead were sieved during this investigation. Therefore, analytical results do not provide size fraction differentiation between fine and coarse soil fractions.

COMPOSITE SOIL SAMPLES

Field personnel collected three types of soil composite samples during the 2016 field investigations. Soil subsamples collected by field personnel were submitted to the analytical laboratory, where laboratory personnel combined equal aliquots of soil from each soil subsample into one composite sample for analysis. The following lists the three types of composite sampling conducted.

- Targeted soil sampling: Composite samples consisted of collecting soil from five subsample locations. Approximately equal aliquots of soil were collected from the 0 – to 6-inch depth interval at each subsample location. These samples were collected from area within the historical landfill where post-treatment operations occurred.
- Grid soil sampling (September and October 2016): Field personnel collected soil from four to six soil subsample locations within each grid cell, depending on grid cell size. Field personnel collected equal aliquots of soil from the 0 – to 6-inch depth interval and, at select locations, from the 1- to 2-foot depth interval at each subsample location. These samples were collected within the historical landfill and on adjacent properties.
- Excavation test pits: Field personnel collected approximately equal aliquots of soil from four to five soil subsample locations within the target depth interval in each test pit. The subsamples were collected from each test pit sidewall and, usually, one from a test pit corner. These samples were collected within the historical landfill area.

Section 2.9.8 provides additional soil investigation details and results. **Table 1** (**Appendix B**) lists the samples and sample types collected. The following presents the general preparation methods related to collecting and compositing soil samples.

2.9.5 Soil Screening Levels and Groundwater Standards

The following sections discuss development of soil screening levels and identification of groundwater standards.

2.9.5.1 Soil Screening Levels

Soil screening levels used for this investigation project were obtained from multiple sources, including the following:

- Montana background threshold values (BTVs) for soil (Hydrometrics 2013);
- Montana dioxin background values for rural agricultural land (DEQ 2011);
- May 2016 EPA Regional Screening Levels [RSLs; Target Risk (TR) = 1E-6; Hazard Quotient (HQ) = 1.0] (EPA 2016);
- Montana DEQ Surface and Subsurface Soil Screening Flowchart (DEQ 2016a);
- Montana DEQ Risk-Based Corrective Action (RBCA) Guidance for Petroleum Releases (2016b);
- Montana Numeric Water Quality Standards, Circular DEQ-7 (DEQ 2017a);
- Montana DEQ Dioxin toxicity equivalents (TEQ) Calculator (DEQ 2005);
- EPA guidance for development of site-specific soil screening levels for protection of groundwater (PGW SSLs) (EPA 1996).

Generic soil screening levels were calculated using the methods specified in the DEQ flowchart (DEQ 2016a). TEQs were calculated using the Montana TEQ calculator (DEQ 2005) and compared to screening levels for 2,3,7,8-tetrachlorodibenzodioxin (TCDD). Lead direct contact (DC) screening levels were set to 153 milligrams per kilogram (mg/kg) for residential exposure and 679 mg/kg for industrial exposure, as directed by DEQ. These lead screening levels are based on 5 micrograms per deciliter (µg/dL) blood levels as determined by the EPA Integrated Exposure Uptake Biokinetic Model (IEUBK) (EPA 2007). Screening of mercury compounds used the elemental mercury RSL values unless otherwise stated; mercury was found at concentrations of 4.1 mg/kg in soils from the bottom of the landfill. All generic protection of groundwater (PGW) SSLs assume a default dilution attenuation factor (DAF) of 10. **Appendix N** includes a master list of screening levels**.**

Generic PGW SSLs from the RBCA petroleum release guidance (DEQ 2016b) were based on a depth to groundwater of greater than 20 feet. Soil excavation samples collected for analysis of extractable petroleum hydrocarbons (EPH), volatile petroleum hydrocarbon (VPH), volatile organic compound (VOC), and semivolatile organic compound (SVOC) (samples names SP0X-X) were collected from the upper portion of the landfill, with samples collected from the surface to no greater than 4.1 feet below grade. Soil boring samples (SB01 through SB03) of shale bedrock material at the groundwater interface were screened against the 0 to 10 feet leaching to groundwater value in the RBCA guidance. Static water levels measured in wells completed within the landfill boundaries (GW01 and GW02) were greater than 32 feet below the top of the well casing.

Site-specific PGW SSLs are based on calculation of a site-specific soil-water partitioning coefficient derived from synthetic precipitation leaching procedure (SPLP) data and assume a DAF of 10. **Section 2.9.5.2** discusses calculation of the site-specific screening levels.

Direct contact construction worker screening levels were calculated for analytes at concentrations greater than the residential direct contact screening level. If a direct contact construction screening level is not presented, none of the samples for that analyte exceeds residential direct contact screening levels or construction worker direct contact levels. Calculations of noncarcinogenic screening levels are based on a hazard index of 0.1. Construction worker direct contact screening levels are presented in **Appendix N**.

Tables 2.9-2 presents screening levels for all analytes detected at the Facility in surface (0 to 2 feet) and subsurface (greater than 2 feet) soil. An extended list of screening levels for soils, including analytes that were not detected but had reporting limits greater than screening levels, is included in **Table 2** in **Appendix B**.

Table 2.9-2. Soil Screening Levels for Detected Analytes (mg/kg)

Analyte	BTV(1)	Direct Contact(2)			PGW(3)		Max. Conc.
		Res.	**Ind.**	**Con.**	**Gen.**	**SS**	
2,4-D	-	70	960	-	0.18	-	0.0469
Aliphatic (C09-C18)	-	110	540	900	53000 / 270000(4)	-	147
Aliphatic (C19-C36)	-	24000	2.00E+05	2.00E+05	-	-	118
Aromatic (C09-C10)	-	130	1000	1000	130 / 720(4)	-	0.41
Aromatic (C11-C22)	-	490	3900	3900	370 / 2000(4)	-	60.7
Arsenic	22.5	0.68	3	19.5	2.9	0.015	83.4
Barium	429	1500	22000	152185.7	1600	22000	3830
Benzo(b)fluoranthene	-	0.18	3.2	54	23 / 120(4)	-	0.239
Benzo(g,h,i)perylene	-	-	-	-	-	-	0.126
Benzo(k)fluoranthene	-	1.8	32	540	230 / 1200(4)	-	0.068
bis(2-Ethylhexyl)phthalate	-	39	160	-	14	-	0.169
Cadmium	0.7	7.1	98	2089.5	3.8	21	26
Chromium	41.7	-	-	-	1800000	-	62.8
Chrysene	-	18	320	5400	690 / 3500(4)	-	0.162
Dichlorprop	-	-	-	-	-	-	0.0936
Diethylphthalate	-	5100	66000	-	2.44	-	0.274
Dinoseb	-	6.3	82	67.5	0.62	-	0.127
Dioxins/Furans (TEQ)	1.36E-6	1.36E-06	4.80E-06	2.20E-05	4.6E-05		0.002927
Fluoranthene	-	300	2500	2500	550 / 2800(4)	-	0.309
Lead	29.8	153	679	153	140	478	53000
MCPA	-	3.2	41	27	0.008	-	100
MCPP	-	-	-	-	-	-	9.52
Mercury	-	1.1(4)	4.6(4)	6.4	1	-	5.7
Methylene Chloride	-	57	1000	-	0.013	-	0.0914
Naphthalene	-	4.3	19	140	12 / 62(5)	-	0.069
Pentachlorophenol	-	1	4	77.2	0.014	3.56	16.8
Phenanthrene	-	-	-	-	-	-	0.178
Picloram	-	440	5700	-	-	-	0.0025
Pyrene	-	220	1900	1900	3400 / 18000(5)	-	0.39
Selenium	0.7	39	580	-	2.6	-	4.9
Silver	0.3	39	580	-	8.51	-	24.3
Tetrachloroethene(6)	-	24	100	-	0.023	-	0.212

Table 2.9-2. Soil Screening Levels for Detected Analytes (mg/kg) – Cont.

Analyte	BTV(1)	Direct Contact(2)			PGW(3)		Max. Conc.
		Res.	**Ind.**	**Con.**	**Gen.**	**SS**	
Toluene	-	610	5500	5500	21 / 100(5)	-	0.0781
Total Extractable Hydrocarbons	-	-	-	-	-	-	399

(1) Soil background threshold values were taken from Hydrometrics (2013) for metals and DEQ (2011) for Dioxins/Furans. For Dioxin/Furans TEQ values, the 95% Chebyshev upper confidence limit for rural agricultural land was used.

(2) Generic direct contact screening levels from Montana DEQ's Risk-Based Corrective Action Guidance (RBCA)(DEQ 2016a) (groundwater > 20 feet) or calculated using the Montana DEQ Flowchart (RSL)(DEQ 2016b). Additional construction screening levels were calculated for analytes that were detected at concentrations greater than the residential direct contact level or were non-detect but had PQLs greater than the residential direct contact level.

(3) Generic protection of groundwater screening levels from DEQ 2016a (groundwater > 20 feet) or calculated from DEQ (2016b).Site specific protection of groundwater screening levels were calculated by determining a site specific soil-water partitioning coefficient (Kd) using the synthetic precipitation leaching procedure (SPLP). A default dilution attenuation factor (DAF) of 10 is used.

(4) Elemental mercury RSLs. High mercury concentrations at the bottom of landfill suggest that elemental mercury is present.

(5) Protection of groundwater screening levels from Risk-based Corrective Action (RBCA) guidance for 0 – 10 feet depth to groundwater and greater than 20 feet to groundwater. The lower value should be used to evaluate soil boring samples at the groundwater interface (SB01 – SB03).

(6) Tetrachloroethene was detected at one location during initial sampling, but was not detected at the same location or in the vicinity during follow-up sampling.

BTV - Background Threshold Value
Con. – Construction
Gen. – Generic
Ind – Industrial
Res. – Residential
Max. Conc. – Maximum concentrations found in samples
PGW - Protection of Groundwater
SS – Site-Specific

2.9.5.2 Site-Specific Protection of Groundwater Screening Levels

Site-specific PGW screening levels were calculated for analytes at the Facility that exceeded the generic PGW soil screening values. The approach used analytical SPLP soil data in a soil/water partition equation that accounts for soil and contaminant properties as well as human health standards for groundwater (EPA 1996). The model used an analyte-specific soil-water partitioning coefficient (K_d) derived from SPLP and total analyte concentration data. Site-specific PGW values were not calculated for some analytes because there was not sufficient data to calculate a K_d value; in these cases, the only the generic PGWs were used. **Table 2.9-3** presents model assumptions and parameters. The model equations are presented following the table.

Table 2.9-3. Model Variables for Site-Specific Protection of Groundwater Soil Screening Levels

Variable	Units	Description	Value/Assumption
θ_a	Unitless	Volume fraction of air in sample	0.18
θ_w	Unitless	Water fraction of air in sample	0.23
ρ_b	kg/L	Soil bulk density	1.5
C_{SPLP}	mg/L	Concentration of analyte in SPLP leach	Analyte Specific
C_T	mg/kg	Concentration of analyte in soil sample	Analyte Specific
DAF	Unitless	Dilution attenuation factor	10
H'	Unitless	Henry's law constant	Analyte Specific
HHS_{DEQ-7}	mg/L	DEQ-7 Human health Standard for groundwater	Analyte specific
K_d	L/kg	Soil water partitioning coefficient	Calculated from SPLP
LC	mg/L	Leachate criterion	Analyte specific
M_s	kg	Mass of soil sample	0.1
Site Specific PGW	mg/kg	Site-specific leaching to groundwater soil standard	Analyte specific
V_L	L	Volume of SPLP leachate	2

First, a K_d value was calculated from the analyte-specific SPLP and total recovery data (**Equation 1**). The K_d value represents the laboratory equilibrium partitioning of the contaminant between the solid and aqueous phase in soil. If multiple samples were available to calculate a K_d value, the mean value was used.

Equation 1. Soil-Water Partitioning Coefficient

$$K_d = \frac{(C_T M_s - C_{SPLP} V_L)/M_s}{C_{SPLP}}$$

The analyte-specific K_d value was then used in a model that calculates the site-specific PGW screening level (**Equation 2**).

Equation 2. Site-Specific Protection of Groundwater

$$Site\ Specific\ PGW = LC\left\{K_d + \left(\frac{\theta_w + \theta_a H'}{\rho_b}\right)\right\}$$

The leachate criterion (LC) in **Equation 2** was calculated using the Circular DEQ-7 human health standard (HHS) for groundwater (DEQ 2017a) and DAF (**Equation 3**). The model assumed a DAF of 10 derived from the DEQ soil screening levels (DEQ 2016).

Equation 3. Leachate Criterion

$$LC = HHS_{DEQ-7} * DAF$$

Tables 4 through 8 in Appendix B include SPLP analytical data. **Appendix N** includes calculations of site-specific PGW screening levels.

An Arsenic K_d value of 0.0001 was used in the site-specific PGW screening level calculation because the calculated value was negative. Additionally, the site-specific PGW screening level for cadmium is based upon only one SPLP sample; other samples did not have sufficient recovery of cadmium for additional calculations.

2.9.5.3 Groundwater Screening Levels

Analyte concentrations in groundwater were screened against DEQ human health standards (DEQ-7). Screening levels for detected analytes are presented in **Table 2.9-4**. Table 3 (**Appendix B**) includes an extended list of screening levels, including analytes that were not detected but where the laboratory PQL was greater than the groundwater HHS or risk-based screening level (RBSL).

Table 2.9-4. Groundwater Screening Levels for Detected Analytes (µg/L)

Analyte	Groundwater HHS or RBSL(1)	RRV(2)	Maximum detected concentration
Arsenic	10	1	3.3J
Barium	1000	3	128
Cadmium	5	0.03	0.85
Lead	15	0.3	0.1
Silver	100	0.2	0.47
Ethylbenzene	700	1	0.41
m&p-Xylene	10000	-	0.87
Naphthalene	100	10	0.29
o-Xylene	10000		0.35
Xylene (Total)	10000	3	0.87
Aromatic (C09-C10)	1100	-	0.82
Dioxins/Furans (TEQ)	0.000002	-	0.0000023(3)

(1) Groundwater human health standard (HHS) from draft DEQ-7 Circular (DEQ 2017a) and risk based screening levels (RBSLs) from Montana Risk-Based Corrective Action Guidance for Petroleum Releases (DEQ 2016a). Metals criteria based on dissolved fraction.
(2) Required reporting limit from DEQ 2017a
(3) Highest reported dioxins/furans TEQ exceed Groundwater HHS, but were lower or similar to field blank and method blank
HHS – Human Health Standard
RBSL – Risk Based Screening Level
RRV – Required Reporting Value
TEQ – Toxicity Equivalent

2.9.6 Data Quality Assurance/Quality Control

2.9.6.1 Work Plans

Tetra Tech prepared sampling and analysis plans (SAP) to guide site investigation during each phase of work. **Appendix I** includes copies of the SAPs. The Initial SAP included a quality assurance project plan (QAPP) that was used throughout the investigations. The initial SAP specified the project scope of work, project purpose and objectives, data quality objectives, investigation methods, standard operating procedures (SOPs), and quality assurance/quality control (QA/QC).These documents include:

- **Central Post SAP (Tetra Tech 2016b):** This SAP details the initial investigation of surface soils and groundwater at the Facility, including the installation, development, and sampling of groundwater monitoring wells GW01, GW02 and GW03. The plan also includes targeted sampling of surface soils and the landfill's clay cap material in areas where PCP was thought to be used. The plan outlines the methods and QA/QC used throughout the investigation.
- **Central Post SAP Addendum (Mod A; September, Tetra Tech 2016c):** This SAP includes additional sampling of surface and subsurface soils at the Facility for COPCs identified during the original investigation. Tetra Tech performed soil borings into the landfill to evaluate whether COPCs found in surface soils had leached into the subsurface and installed monitoring well MW05.
- **Additional Sampling for Modification A (October, Tetra Tech 2016d):** This modification includes additional surface soil sampling for metals and dioxins to evaluate the extent of COPCs at the Facility property and on adjacent properties.
- **Additional Sampling for Modification A (February 2017, Tetra Tech 2017a):** This modification includes adding a well (MW06) down-gradient of the landfill and completing surface soil sampling to evaluate the extent of metal COPCs in the southwestern portion of the Facility.

2.9.6.2 Documentation

Tetra Tech personnel documented field efforts by recording site investigation and remediation activities in a field notebook and on test pit, boring, and well logs; and groundwater sampling forms. **Appendix J** provides copies of field notes; test pit, boring, and well logs; and groundwater sampling forms. **Appendix K** includes a photograph log documenting site investigation activities.

2.9.6.3 Decontamination and Sample Handling

Field personnel decontaminated all re-useable equipment prior to use at the Facility, between sample locations, and sample intervals; and between collection of natural, duplicate, and equipment rinsate blank samples. SOP-11 was used as guidance for equipment decontamination (see SAPs in **Appendix I**).

Field personnel collected all soil and water samples in laboratory-provided containers. Waterproof sample storage bags and coolers were provided by the analytical laboratory for sample storage and transport. Samples were kept on ice after collection, and ice was replenished as needed during the field effort and before final transport to the laboratory.

Transport of samples was either by United Parcel Service with overnight service to the Pace Analytical laboratory in Billings, Montana, or by the Pace analytical courier. Field personnel documented all samples on laboratory chain-of-custody forms. The chain-of-custody forms remained with the samples throughout storage and transportation. Field personnel signed, dated, and documented the time on the chain-of-custody upon transfer of the samples to the overnight delivery carrier, or laboratory courier, with the laboratory documenting the time of receipt.

2.9.6.4 QA/QC Samples

Field personnel collected QA/QC samples to evaluate precision, accuracy, representativeness, and completeness, including:

- Duplicates of surface soil and groundwater samples at a frequency of one duplicate per 10 natural samples.
- Field sampling blanks at a frequency of one blank per sampling event, with the exception of the June 2016 sampling event (where no blanks were collected).
- Equipment rinsate blank samples were collected when non-disposable sampling equipment was used. Collection frequency was one equipment rinsate blank per sampling event.
- VOC travel blanks (trip blanks) were submitted with each shipment of VOC samples. The trip blanks were transported in each cooler containing VOC samples.

Soil duplicates were not collected for soil boring samples because of the low recovery of available sample when using a split spoon. Additionally, duplicate samples were not collected for soil dioxin/furans analysis.

2.9.6.5 Data Validation

The analytical laboratory (Pace Analytical) generated five laboratory data packages for sampling conducted during the February 2016, June 2016, September 2016, October 2016, and February 2017 investigations. Tetra Tech performed a Level 2A data validation on the analytical data packages in accordance with DEQ's Data Validation Guidelines for Evaluating Analytical Data (http://deq.mt.gov/StateSuperfund/PDFs/DataValidationReport.pdf) and followed EPA Contract Laboratory Program (CLP) National Functional Guideline documents for review of organic, inorganic, and dioxin/furan data (EPA 2011,EPA 2014a, EPA 2014b). **Appendix L** includes copies of the laboratory analytical reports, data validation reviews, and an Excel spreadsheet with all sample data.

SOIL DATA QUALIFICATIONS

Field personnel collected 14 soil duplicates, three equipment rinsate blanks, and two travel blanks during the investigation. The majority of sample results qualified in the database were either qualified as estimated (J) because the concentration of analyte was detected between the method detection limit (MDL) and the laboratory's PQL or were non-detect (U) because the analyte was not detected at or above the PQL. Samples qualified for other reasons include:

- Field duplicate relative percent difference (RPD) outside control limit: Associated results were qualified as estimated (J). These results include two for arsenic, two for cadmium, three for lead, three for mercury, and one for PCP.
- Holding time exceeded: Associated results were qualified as estimated and potentially biased low (J-). These results include four samples for mercury.
- Laboratory accuracy and precision outside control limit: Associated results were qualified as follows:
  - Estimated and potentially biased low (J-). These results included four samples for arsenic, two for cadmium, four for chromium, two for lead, one for mercury, and three for selenium.
  - Estimated and potentially biased high (J+). These results include one for lead, two for mercury, and one for octachlorodibenzodioxin (OCDD).
  - Non-detect and potentially biased low (UJ). These results include one for dicamba and two for selenium.

- Laboratory blank contamination: Associated results were qualified as follows:
    - Non-detect (U). These results include one for barium and four for total TCDD (dioxin/furan congener).
    - Estimated and potentially biased high (J+). These results include two samples that had multiple dioxin/furan congeners in the method blank.

WATER DATA QUALIFICATIONS

Two groundwater duplicates, three field blanks, and four trip blanks were collected during groundwater sampling events. All groundwater sample results were qualified as estimated (J) because analytes were detected between the MDL and PQL. Select sample results were qualified as non-detect (U) for the following reasons:

- Field blank contamination: Associated results were qualified as non-detect (U). These results include one chromium result, one for 1,2,3,4,7,8- hexachlorodibenzo-p-dioxin, two for OCDD, and two for total heptachlorodibenzo-p-dioxin.
- Method blank contamination: Associated results were qualified as non-detect (U). These results include three for naphthalene, two for mercury, one for total extractable hydrocarbons, one for barium, two for mercury, and one for PCP.

PRECISION, ACCURACY, REPRESENTATIVENESS, AND COMPLETENESS

The following summarizes the precision, accuracy, representativeness, and completeness of the data collected for all soil and groundwater samples collected during the investigations.

Precision & Accuracy

The data are considered accurate and precise with qualifiers indicating sample results that did not meet accuracy and precision targets. The RPD goal for field samples from this project was 35 percent (or less) for water samples and 50 percent (or less) for solid matrix samples. In accordance with EPA National Functional Guidelines for Inorganic Superfund Data Review (EPA 2014a), field RPD was calculated for sample and duplicate pairs for cases when both results were greater than five times the MDL. The absolute difference between the sample and duplicate result was compared with the MDL for other samples where both the sample and duplicate were detected (not U-qualified).

- The mean RPD for soil samples was 35.7 percent. Field personnel collected 14 duplicate soil samples across all investigations, totaling 325 analyte pairs. Only 27 analyte pairs had analytical results greater than 5 times the MDL for both samples tested.
- The mean RPD for groundwater samples was 2.1 percent. Field personnel collected two duplicate groundwater samples across all investigations, totaling 309 analyte pairs. Only barium had results greater than 5 times the MDL in both of the samples tested.

A total of 16 analytes were qualified as estimated and potentially biased low (J-) due to matrix spike/matrix spike duplicate (MS/MSD) criteria. An additional four analytes were qualified as estimated and potentially biased high (J+) based on MS/MSD criteria.

Representativeness

The data are considered representative as the sample locations were selected to meet investigation goals as specified in the SAP and investigation addendums. The samples are considered representative of other samples collected, handled, preserved, and analyzed in the same manner and conditions.

Completeness

The data are considered 100 percent complete as the data were collected as per the SAP and investigation addendums. For water samples, DEQ reporting limits were not met in a few instances. In some cases, the HHS or RBSL were lower than PQL, although most analytes had MDLs below HHS and RBSLs for groundwater. For soils, some screening levels were lower than the PQL in some instances. These cases are discussed with the presentation of the analytical data below.

2.9.6.6 Deviations from the Sampling and Analysis Plans

Deviations from the SAPs include:

1. The SAP (Tetra Tech 2016b) indicated that groundwater monitoring well boreholes would be sealed with hydrated bentonite from the top of the filter pack to 2 feet bgs. Cement rather than hydrated bentonite was used at SB01/MW01 and SB02/MW02 to provide extra protection to help reduce leaching to groundwater within the landfill. The procedures outlined in the SAPs were followed at SB03/MW03 because the borehole was not within the boundary of the landfill and was, instead, completed in native soils and bedrock.
2. The SAP (Tetra Tech 2016b) called for the analysis of surface soil samples for dioxins and furans. However, no surface soil samples were analyzed for dioxins and furans because the concentrations of PCP in surface soils samples were substantially lower than those observed in subsurface soil samples.
3. The SAP (Tetra Tech 2016b) called for collection of two soil samples for each soil boring location. However, only a single soil sample was collected from each borehole because no evidence was found for COPCs in the soil and waste recovered, as indicated by on-site field screening using a photoionization detector (PID) and heated headspace method. Rather, only a single soil sample was collected in each borehole, corresponding to the approximate air-water interface (the depth where groundwater was encountered).
4. The naming convention for borehole soil samples deviated from the proposed sampling regime in the SAP (Tetra Tech 2016b). The SAP specified that sample names include a suffix that indicated the depth where the sample was collected. Instead, a consecutive postfix number was used, such as SB01-001, where “SB01” is the borehole number and “-001” is the postfix number.
5. The SAP (Tetra Tech 2016b) proposed collecting 21 soil samples (including soil duplicates) from the soil excavation test pits. However, only 20 soil samples were collected. Only one of two proposed samples was collected at excavation test pit SP05 because the landfill clay cap was only 6 inches thick at the sampling location.
6. SAP Modification A (Tetra Tech 2016c) proposed surface soil sampling (1 to 2 feet bgs) of dioxins/furans at 16 sample grid cells within the landfill footprint. Soil samples were collected, but not analyzed in cells 4, 5, 6, 7, 8, 9, 10, 11, and 16, after initial laboratory results indicated that dioxins/furans exceeded screening levels across the entire landfill.
7. SAP Modification A (Tetra Tech 2016d) proposed surface soil sampling (1 to 2 feet bgs) of dioxins/furans in cells 41 and 36 if trash was present in soil. During sampling, there was no indication of landfill material in soil excavations, so soil samples were not collected. Dioxin/furan soil samples were collected from 0 to 6 inches bgs at these locations.
8. SAP Modification A (Tetra Tech 2016d) proposed surface soil sampling (1 to 2 feet bgs) of dioxins/furans in outer perimeter cells 40, 42, and 43. Soil samples were collected but not analyzed because inner perimeter soil samples (samples closer to the landfill and COPC source) indicated analytes were lower than screening levels.
9. Soil sample G-12-12L was labeled incorrectly in the field. SAP Modification A (Tetra Tech 2016c) prescribed the sample identification number as G-12-2L at sampling point 12-2; instead it was labeled as G-12-12L

2.9.7 Conceptual Site Model

A Conceptual Site Model (CSM) was developed based on information obtained through historical research and investigations at the Facility. The following sections describe the historical primary sources of contamination. **Figure 7** (**Appendix A**) presents a diagram depicting the CSM of the Facility. The site investigations for this EA were designed to evaluate the nature and extent of contamination from these sources.

Table 2.9-5 presents potential primary sources of contamination for this EA. Possible metals, VOCs, SVOCs, petroleum products, and dioxins/furans associated with these sources have the potential to affect soil and groundwater.

Table 2.9-5. Primary Sources of Contamination

Potential Primary Source	Reason	Potential Area of Impact
Historical post treatment operations	Potential leaks/spills to soil of treatment solution (pentachlorophenol-diesel mixture).	Soils within the operational footprint of the historical post treatment operation.
Historical landfill	Disposal of wastes containing COPCs and burning of landfill waste (partial combustion may produce COPCs).	Surface and subsurface soils within the property boundary; surface soils of downwind areas from burning operations.
Clandestine dumping	Dumping wastes containing COPCs.	Surface and subsurface soils within the property.
Current wood mill and biofuels operation	Potential leaks/spills to soil of hazardous or non-hazardous substances.	Soils within the current operations area.
Current scrap-wood burn pile	Partial combustion may produce COPCs.	Surface soils on the east side of property (former wood treatment drying area) and downwind soils.
City Burn Pile	Partial combustion may produce COPCs.	Whole Facility downwind of city burn pile.
Weed Control	Herbicides are a potential source of COPCs to surface and subsurface soils.	Historical landfill area.

CPTC operated a PCP and diesel wood post treatment operation at the landfill from 1968 to 1973. DEQ identified these operations as the primary source of concern for potential contaminants at the Facility. COPCs include PCP, dioxins/furans, and diesel range organic hydrocarbons. These contaminants, if present, were thought to have contaminated surface soils at the Facility at the time of post treatment operations. During that period, the surface soil at the site was composed of a clay cap. The cap was installed over the landfill sometime between landfill closure in 1960 and initiation of the post-treatment operations in 1968.

The historical landfill, which operated prior to the PCP post treatment operation, is also a source of COPCs because of the unknown nature of the wastes disposed. In addition to disposal of waste, the landfill was also periodically burned, which may have produced dioxin/furan compounds and polynuclear aromatic hydrocarbons (PAHs) from incomplete combustion of organic matter. These materials may have collected in burned soils and residues or have been carried downwind.

After closure of the PCP post treatment operation, the Facility continued to be used as an unsanctioned dumping area. These activities continued until the 1990s. The nature of the waste dumped at the Facility during this period is unknown, but may be a source of surface and subsurface contamination at the Facility.

In the 1990s, the City of Lewistown spread 2 feet of street sweepings over the landfill to augment the eroding clay cap. Based upon MDHES documents from the 1990s, the street sweepings were tested for petroleum products and metals before they were applied. The street sweepings did not contain these potential contaminants and were approved for use. Therefore, the street sweepings are not considered a primary source of COPCs in this EA.

Weed control operations at the Facility are a potential source of COPCs to surface and subsurface soils. City of Lewistown documents discussed a serious, noxious weed problem at the Facility during the 1990s and identified the need for the Lewistown Public Works Department to implement chemical weed control.

Currently, the Facility is used as a wood mill, biofuel production operation, and base of operations for a small trucking operation. Equipment maintenance is performed in un-paved areas and solvents, oils, and industrial and automotive chemicals may spill or leak into the soil. Additionally, the current operators at the Facility maintain a small burn pile for discarded wood from the milling operation and garbage. The burn pile may be a source of COPCs to soils and to downwind areas.

Finally, the City of Lewistown maintains a large burn-pile upwind of the Facility where discarded wood and other plant-based material is regularly burned.

2.9.8 Soil Investigation

This section presents a summary of field investigation methods implemented during this investigation, followed by investigation results.

2.9.8.1 Soil Investigation Methods

Tetra Tech completed four types of soil investigations at the Facility in 2016. These include:

- Targeted surface soil investigation;
- Grid cell surface soil investigation;
- Excavation test pit investigation;
- Subsurface soil borehole investigation.

The following sections present an overview of each investigation method. The investigation SAP (Tetra Tech 2016b), SAP addendums (Tetra Tech 2016c, 2016d, 2017a), and the initial investigation report (Tetra Tech 2016a) provide additional investigation method details. Section 2.9.6.6 discusses deviations from the SAPs. **Table 1 (Appendix B)** lists the samples and sample types collected.

TARGETED SURFACE SOIL INVESTIGATION – FEBRUARY 2016

Tetra Tech conducted targeted surface soil sampling in three areas suspected to be impaired by COPCs. The target areas were each approximately 2,500 square feet (ft^2) in size. Field personnel hand-excavated test pits at five subsample locations within each 2,500 ft^2 area. The excavations extended to 6 inches bgs. Approximately equal aliquots of soil were collected from the 0- to 6-inch depth interval within each subsample test pit. Field personnel submitted the five subsamples for each area to the analytical laboratory, where laboratory personnel combined equal aliquots of each subsample into one composite soil sample for laboratory analysis. These samples were named SS01, SS02, and SS03 (**Figure 11, Appendix A**).

GRID SOIL SAMPLING –SEPTEMBER AND OCTOBER 2016

Tetra Tech divided the landfill property into an approximately 50-foot by 50-foot grid system for the September 2016 investigation (**Figure 11, Appendix A**). Additional 50-foot by 50-foot grid cells were added during the October 2016 investigations, which included areas adjoining the landfill. The purpose grid soil sampling was to evaluate the extent of impacts from site operations with the additional grid cells added to refine areas of impacts.

A backhoe (February and September 2016) or hand auger (October 2016) was used to excavate test pits at four to six soil subsample locations, with the number of subsample locations depending on the size of the grid cell. Cells with four subsample locations represented an area approximately 10,000 ft^2 and cells with six subsample locations represented an area approximately 15,000 ft^2.

Field personnel collected approximately equal aliquots of soil from the 0- to 6-inch depth interval and, at select locations, 1- to 2-foot depth interval from within each subsample excavation test pit. Field personnel submitted the five subsamples for each area to the analytical laboratory, where laboratory personnel combined equal aliquots of the each subsample into one composite soil sample for laboratory analysis. These samples included a C- prefix in the sample name.

EXCAVATION TEST PITS – FEBRUARY 2016, SEPTEMBER 2016, OCTOBER 2016, FEBRUARY 2017

The initial February 2016 investigation focused on collecting soil samples from the top 6 inches and bottom 6 inches of the landfill clay cap material, regardless of where in the soil profile the clay cap was present (at the surface or under street sweepings). These soil excavation pit samples can be identified with the SP prefix. The locations of the pits are shown in **Figure 10** (**Appendix A**).

Subsequent excavation test pit work targeted sampling of surface soil/materials present from the 0- to 6-inch and 1- to 2foot soil depth intervals. A backhoe was used to excavate one test pit within each 2,500 ft^2 area of investigation. Four subsamples were collected from each test pit sidewall and, usually, one test pit corner. The subsamples were field composited before they were shipped to the laboratory. These samples contained the prefix G-. The locations of the pits are shown in **Figure 10** (**Appendix A**).

SUBSURFACE SOIL BOREHOLES

Three subsurface soil boreholes (SB01, SB02, and SB03; **Figure 10** [**Appendix A**]) were drilled during the February 2016 investigation. The boreholes were drilled to the first water-bearing zone and were completed as groundwater monitoring wells (see Section 2.9.5). Split-spoon samplers were used during drilling to collect subsurface soil for logging and sampling. Field personnel collected grab subsurface soil samples from the approximate air-water interface in each borehole to evaluate impacts from potential leaching of landfill wastes. Subsurface soil samples were collected for laboratory analysis from 49 to 51 feet bgs in borehole SB01, 66 to 68 feet bgs in SB02, and 22 to 24 feet bgs in SB03.

Tetra Tech conducted an additional subsurface soil investigation in September 2016. Boreholes were drilled on a 50-foot by 50-foot grid system to evaluate the depth to the landfill waste-native soil interface. Two samples were collected from each subsurface soil boring. One sample was collected between the 2- to 10-foot depth interval to evaluate concentrations of COPCs within soil that construction workers could become exposed to during excavation work. The second depth interval sampled was the soil at the landfill waste-native soil interface (between 9 to 36 feet bgs).

Field personnel screened soil in the field using a PID and heated headspace analysis to monitor for volatile organics. The PID was used to evaluate the soil depth interval in the construction worker zone (2 to 10 feet bgs). Field personnel collected the soil sample from the interval exhibiting the highest PID reading. In cases where PID readings did not indicate potential volatile organics, field personnel collected soil samples from the 4- to 6-foot bgs depth interval.

SOIL METHANE MONITORING

In February 2016, Tetra Tech installed three soil vapor probes in the landfill to screen for the presence of methane gas (Tetra Tech 2016a). The gas probes were installed by pushing 2-inch-diameter steel push rods to a depth of 3.5 feet bgs. A 6-inch Geoprobe soil vapor point connected to ¼-inch tubing was installed to the bottom of the hole. The hole was backfilled with 12 inches of 10-20 mesh silica sand and 2 feet of bentonite. The tubing at the soil surface was sealed with a clamp when soil gas was not being monitored. Methane, carbon monoxide, oxygen, and hydrogen sulfide concentrations were monitored with a RKI GX-2012 4-gas meter. The locations of the three soil vapor probes are show in **Figure 3** (**Appendix A**).

Methane and hydrogen sulfide were not detected during soil vapor monitoring. Tetra Tech monitored soil gas on two occasions at the Facility: first on February 12, 2016, and again on February 16, 2016. Carbon monoxide was detected at 50 parts per million (ppm) at one location on February 12, 2016. Additional information is provided in the Phase II investigation report (Tetra Tech 2016a).

2.9.8.2 Landfill Waste and Cover Evaluation Results

DEPTH OF LANDFILL COVER

Tetra Tech investigated the depth of the landfill cover across the footprint of the historical landfill in September 2016. The landfill covers approximately 4 acres of the Facility. The landfill area was gridded at 50-foot by 50-foot intervals across top of the landfill, with one grid point at the approximate center of each grid cell, representing every 2,500 ft^2 of landfill. The purpose of this investigation was to assess the depth of the landfill cover soil. The sampling locations include grid sampling points in the approximate center of cells 1 through 16 (**Figure 8, Appendix A)**. At each grid point, a soil pit was excavated and the depth to landfill waste recorded. **Figure 8 (Appendix A)** presents a contour map showing the landfill waste surface based on test pit location and depth to waste. The contour map was produced using the regularized spline function in ArcGIS 10.2

The field data collected, along with **Figure 8 (Appendix A)**, indicate the landfill cover is less than 2 feet thick across most of the landfill area. Approximately 2.5 acres of the 4-acre landfill has less than 2 feet of cover over the landfill waste. The cover material in many of these areas consisted of street sweepings (fine sands to gravels), not clay, as would traditionally be found in a landfill cap.

The southern one-third of the Facility has soil cover of less than 1 foot thick, and waste is visible at the surface across much of this area. This area is approximately 1 acre and is concentrated in the southern and central quadrants of the Facility. This area corresponds with the parts of the Facility that are utilized by current operations. The use of heavy machinery and vehicle traffic over this area may have contributed to erosion of the soil cover over time.

DEPTH OF LANDFILL WASTE

Tetra Tech investigated the depth of landfill waste at the Facility in October 2016 using a hollow-stem augur drill rig to drill boreholes to the bottom of the landfill at 14 locations **(Figure 9, Appendix A)**. The borehole location and depth of wastes were used to generate a landfill depth contour map **(Figure 9, Appendix A)** in ArcGIS using the regularized spline function. The input data also included depth of landfill waste from February 2016 boring logs (SB01 and SB02).

The field data and ArcGIS results indicate that the deepest portion of the landfill runs from southeast to northwest through the center of the landfill area. The landfill is up to 38 feet deep, which corresponds to an approximate elevation of 3,995 feet. At its lowest point, the landfill appears to be approximately 10 feet above the water-bearing zone, as evaluated by developing a cross section from GW01 to GW02 (**Figure 7, Appendix A**). The deepest portion of the landfill is directly beneath the area used to treat poles with diesel and PCP mixture.

CONTAMINANTS OF POTENTIAL CONCERN IN SURFACE SOILS

COPCs that were detected in surface soils (0 to 2 feet) and exceeded screening levels are discussed below. Analytes are ordered by analyte group (for example, metals, herbicides). **Figures 10** and **11 (Appendix A)** present the sampling locations and grid cells referenced in this discussion.

2.9.8.3 Surface Soil Analytical Results

The following text presents the surface soil analytical results at the Facility. **Section 2.9.2** specifies the analytical methods. Composite sampling from excavation test pits is designated with a "SP" or "G-," composite soil sampling from 0 to 6 inches is designated "SS," and composite grid sampling from 0 to 6 inches and 1 to 2 feet is designated as "C-" in the discussion below and in **Tables 9** through **14 (Appendix B).**

Only analytes detected at or above the laboratory PQL and found to exceed one or more screening levels are discussed in the below sections. Analytes that were not detected, but with PQLs greater than screening levels, are presented and discussed in **Section 2.9.8.5. Tables 9** through **14** present analytical data for surface soils. Tables are organized by soil type (surface versus subsurface soil) and analytical group.

METALS

Tetra Tech collected 122 surface soil samples from the Facility and analyzed the samples for Resource Conservation and Recovery Act (RCRA) 8 metals. Of the 122 surface soil samples, 112 were from soil excavations and 10 were surface composite samples. The following sections summarize the metals results. **Table 9 (Appendix B)** presents the results.

Arsenic

Arsenic exceeded one or more soil screening levels in 21 of the 122 surface soil samples. All residential and industrial DC and PGW screening levels are lower than the BTV, so the BTV was used for initial screening. Samples that exceed the BTV were also evaluated against PGW screening levels. **Figures 12** and **13 (Appendix A)** show the distribution of arsenic concentrations in surface soils at the Facility.

Arsenic concentrations in the 112 excavation test pit samples ranged from 5.9 to 83.4 mg/kg.

- 21 of the 112 excavation pit sample results exceeded the arsenic BTV (22.5 mg/kg), generic PGW (2.9 mg/kg), and site-specific PGW (0.015 mg/kg), with concentrations ranging from 22.8 to 83.4 mg/kg;

Arsenic concentrations in the 10 surface composite soil samples ranged from 7.5 to 21.8 mg/kg.

- The arsenic BTV (22.5 mg/kg) was not exceeded in any composite soil samples.

Soil sample G-3-4L collected from the south-central portion of the Facility exhibited the highest arsenic concentration of 83.4 mg/kg in the sample depth interval of 1 to 2 feet bgs. Twelve soil samples in the same vicinity were also above the BTV with concentrations ranging from 22.8 to 73.4 mg/kg. **Figures 12** and **13 (Appendix A)** include the locations, sample names, and concentrations.

Arsenic was also found to exceed the BTV along the western edge of the landfill in samples G-1-2L, G-1-3L, G-1-4L, G-7-6L, G-2-3U, and G-7-6U, with concentrations ranging from 23.1 to 41.9 mg/kg. Based on the analytical results, approximately 0.9 acre of the landfill exceeds the arsenic BTV.

Barium

Barium exceeded one or more soil screening level in 11 of the 122 surface soil samples **(Table 9, Appendix B)**. **Figures 14** and **15 (Appendix A)** show barium concentrations in surface soils at the Facility.

Specifically, barium concentrations ranged from 115 to 3,830 mg/kg in the 112 excavation test pit samples. Sample RCRA-DUPE2 exhibited the highest barium concentration of 3,830 mg/kg at sampling location G-3-2L in the sample depth interval of 1 to 2 feet bgs.

- 11 excavation test pit samples exceeded the residential DC screening level of 1,500 mg/kg, ranging from 1,550 mg/kg to 3,830 mg/kg.
- 10 of the 11 excavation test pit samples also exceeded the generic PGW screening level of 1,600 mg/kg, ranging from 1,620 to 3,830 mg/kg;
- None of the 112 excavation test pit samples collected exceeded the construction DC of 152,186 mg/kg, the industrial DC of 22,000 mg/kg, or the site-specific PGW screening level of 22,000 mg/kg.

Ten barium surface soil composite samples were collected from the landfill and adjacent properties. Barium concentrations in composite samples ranged from 203 to 420 mg/kg.

- No screening levels for barium were exceeded in the surface soil composite samples.

Samples exceeding barium screening levels were not clustered, like the arsenic data. The exception includes soil samples from the southwestern quadrant of the landfill, including samples G-3-1L, G-3-2L, G-7- 6L, and G-7-6U, and RCRA-DUPE2. Barium concentrations in these samples ranged from 1,620 to 3,830 mg/kg.

Cadmium

Cadmium concentrations exceeded one or more screening levels in 11 of the 122 soil samples **(Table 9, Appendix B). Figures 16** and **17 (Appendix A)** show cadmium concentrations in surface soils at the Facility.

Cadmium concentrations ranged from 0.17 to 26 mg/kg in the 112 excavation test pit samples. Sample G-3-2L exhibited the highest cadmium concentration of 26 mg/kg in the sample depth interval of 1 to 2 feet bgs.

- 11 excavation test pit samples exceeded the generic PGW (3.8 mg/kg)
- Three of the 11 excavation test pit samples exceeded the residential DC screening level of 7.1 mg/kg, with concentrations ranging from 8.4 to 26 mg/kg.
- One of the 11 excavation test pit samples (G-3-2L) exceeded the site-specific PGW screening level of 21 mg/kg, with a concentration of 26 mg/kg;

Cadmium concentrations in surface soil composite samples ranged from 0.26 to 1.5 mg/kg.

- No screening levels for cadmium were exceeded in the surface soil composite samples.

The primary area of cadmium contamination appears to be continuous and is located in the south-central part of the landfill (the area represented by soil samples G-2-2L, G-2-4L, G-3-2L, G-3-3L, G-3-4L, G-4-1L, G-8-1, G-8-2L, G-3-4U, and G-8-2U). The concentration of cadmium in these samples ranged from 3.8 to 26 mg/kg. The area of cadmium-impacted soil that exceeds all screening levels is approximately 0.4 acre. Considering only the residential DC and the site-specific PGW screening levels reduces the areal extent to approximately 0.2 acre. None of the perimeter samples exhibited cadmium concentrations that exceeded screening levels.

Lead

Lead exceeded one or more screening level in 48 of the 122 soil samples **(Table 9, Appendix B). Figures 18** and **19 (Appendix A)** show lead concentrations in surface soils of the Facility.

Lead concentrations in excavation test pit samples ranged from 8.1 to 53,000 mg/kg. Sample G-8-2U exhibited the highest lead concentration of 53,000 mg/kg in the sample depth interval of 0 to 6 inches.

- 41 excavation test pit samples exceeded the residential and construction worker DC screening level of 153 mg/kg, with concentrations ranging from 155 mg/kg to 53,000 mg/kg;
- 12 excavation test pit samples exceeded the industrial DC screening level of 679 mg/kg, with concentrations ranging from 741 to 53,000 mg/kg;
- 45 excavation test pit samples exceeded the generic PGW screening level of 140 mg/kg, with concentrations ranging from 142 to 53,000 mg/kg;
- 16 excavation test pit samples exceeded the site-specific PGW screening level of 478 mg/kg, with concentrations ranging from 481 to 53,000 mg/kg;

Lead concentrations in the surface soil composite samples ranged from 9.9 to 613 mg/kg. Surface soil composite sample SS03 (0 to 6 inches) had the highest concentration of 613 mg/kg.

- Three surface soil composite samples exceeded the residential and construction worker DC screening level of 153 mg/kg, with concentrations ranging from 201 to 613 mg/kg.
- Three surface soil composite samples exceeded the generic PGW screening level of 140 mg/kg, with concentrations of 201 – 613 mg/kg;
- One surface soil composite sample exceeded the site-specific PGW screening level of 478 mg/kg, with a concentration of 613 mg/kg;

Lead exceeded screening levels in much of the central and southern portions of the Facility, totaling an area of approximately 1.8 acres. The extent of lead contamination appears be bounded on the north, east, and south by soil that did not exceed soil screening levels. On the west, the lead concentration in composite sample C-47L was 250 mg/kg, exceeding generic PGW and residential and construction worker DC screening levels. This sample was collected from 1 to 2 feet bgs and was comprised primarily of landfill waste. This sampling location was within the Facility property and located on a steep slope adjacent to Marcella Avenue.

Mercury

Mercury exceeded one or more screening levels in five of the 122 soil samples. Results are provided in **Table 9 (Appendix B)** and **Figures 20** and **21 (Appendix A)**; these results show mercury concentrations in surface soils at the Facility.

Mercury concentrations in excavation test pit samples ranged from 0.011 mg/kg to 5.7 mg/kg. Sample G-7-5U had the highest mercury concentration of 5.7 mg/kg in the sample depth interval of 0 to 6 inches.

- Three excavation test pit samples exceeded the residential DC screening level of 1.1 mg/kg, ranging from 1.2 to 5.7 mg/kg.

- One excavation test pit sample exceeded the industrial DC (4.6 mg/kg) screening level, with a concentration of 5.7 mg/kg.
- Five excavation test pit samples exceeded the generic PGW screening level of 1 mg/kg, ranging from 1.1 to 5.7 mg/kg;

Ten mercury surface soil composite samples were collected from the landfill and adjacent properties. Mercury concentrations in surface soil composite samples ranged from 0.022 to 0.17 mg/kg.

- No mercury screening levels were exceeded in surface soil composite samples.

Samples exceeding mercury screening levels were not clustered and their locations do not appear to be correlated with any known site activities.

Selenium

Selenium exceeded a screening level in one sample **(Table 9, Appendix B)**. Selenium concentrations in excavation test pit samples ranged from 0.32 to 2.8 mg/kg. Sample G-12-2U exceeded the generic PGW screening level of 2.6 mg/kg with a concentration of 2.8 mg/kg in the sample depth interval of 0 to 6 inches.

Selenium concentrations in surface soil composite samples ranged from non-detect to 0.52 mg/kg. Selenium was detected at a concentration of 0.52 mg/kg in surface soil composite sample C-20L from a sampling depth interval of 1 to 2 feet, but was not detected in any other samples. No selenium screening levels were exceeded in surface soil composite samples.

Sample G-12-2U, the only sample to exceed screening levels, was located in the center of the Facility, and four adjacent soil samples to the north, east, west and south contained concentrations below screening levels. This sample is also the location of the only screening level exceeded for silver. The location of the sample corresponds to sampling point 12-2 **(Figure 10, Appendix A).**

Silver

Silver concentrations ranged from 0.085 to 24.3 mg/kg in excavation pit samples **(Table 9, Appendix B)**. Sample G-12-2U had the highest silver concentration of 24.3 mg/kg in the sample depth interval of 0 to 6 inches. Samples G-12-2U exceeded the generic PGW screening level of 8.51 mg/kg, with a concentration of 24.3 mg/kg. No other excavation test pit samples exceeded screening levels.

Silver concentrations in surface soil composite samples ranged from non-detect to 0.81 mg/kg. Silver was detected at a concentration of 0.81 mg/kg in sample SS03 from a sampling depth interval of 0 to 6 inches, but was not detected in any other samples. No silver screening levels were exceeded in surface soil composite samples.

Sample G-12-2U, the only sample to exceed screening levels, was located in the center of the Facility, and concentrations in four adjacent samples to the north, east, west and south were below screening levels. This is also the location of the only screening level exceeded for selenium. The location of the sample corresponds to sampling point 12-2 in **(Figure 10, Appendix A).**

HERBICIDES / PESTICIDES

The herbicide/pesticide investigation included collecting 43 surface soil samples from the landfill and adjacent properties. Of the 43 surface soil samples, 37 were composite samples from excavation test pits and six were composite soil samples from the 0- to 6-inch depth interval. **Table 10 (Appendix B)** includes the results.

2-methyl-4-chlorophenoxyacetic acid (MCPA)

MCPA was analyzed in 43 surface soil samples from the landfill and adjacent properties. EPA Method 8151 used to analyze for MCPA during this investigation. The reporting limit for MCPA is generally higher than residential, industrial, and commercial worker DC and PGW screening levels.

MCPA was detected in only one excavation test pit sample, G-3-3L, above the laboratory PQL with a concentration of 11.5 mg/kg. G-3-3L was collected from a sampling depth of 1 to 2 feet at sample location 3-3 **(Figure 10, Appendix A).** MCPA in G-3-3L exceeded the residential DC screening level of 3.2 mg/kg and the generic PGW screening level of 0.008 mg/kg.

All six surface soil composite samples analyzed for MCPA were non-detect. Therefore, no MCPA screening levels were exceeded in surface soil composite samples.

Pentachlorophenol (PCP)

PCP exceeded one or more screening levels in 23 of the 43 surface soil samples analyzed **(Table 9, Appendix B)**. **Figures 22** and **23 (Appendix A)** show PCP concentrations in surface soils at the Facility.

PCP concentrations in excavation test pit soil samples ranged from non-detect to 16.8 mg/kg. The highest PCP concentration was 16.8 mg/kg in sample SP03-1. Sample SP03-1 was collected from a depth of 1.8 to 2.3 feet. However, this sample was qualified as estimated and potentially biased high (J+) based on matrix effects on surrogate recovery.

- Two samples exceeded the residential DC screening level of 1 mg/kg, with concentrations ranging from 1.8 to 16.8 mg/kg;
- One sample exceeded the industrial DC screening level of 4 mg/kg, with a concentration of 16.8 mg/kg.
- 21 excavation test pit samples exceeded the generic PGW screening level of 0.014 mg/kg, with concentrations ranging from 0.0143 to 16.8 mg/kg;
- One sample exceeded the site-specific PGW screening level of 3.56 mg/kg, with a concentration of 16.8 mg/kg;

PCP concentrations in surface soil composite samples ranged from non-detect to 0.029 mg/kg. Four of the six surface soil composite samples were non-detect. Surface soil composite sample SS03 had the highest PCP concentration of 0.029 mg/kg, which was collected from a sample depth interval of 0 to 6 inches.

- Two surface soil composite soil samples exceeded the generic PGW screening level of 0.014 mg/kg, with concentrations ranging from 0.015 to 0.029 mg/kg.

Considering all screening levels, PCP concentrations exceed screening levels across most of the sampled landfill area. However, most of the screening levels exceeded are attributed to the generic PGW screening level.

Excluding the generic PGW screening level, concentrations at only three locations exceed residential and industrial DCs, or site-specific PGW screening levels. These include samples SP01-1, SP03-1, and SP04-1, which are in close proximity to the former PCP dip tank location. PCP contamination in this area appears to cover approximately 0.1 acre.

PCP in surface soils was also investigated at three locations where water may have carried PCP off site, either from overland flow from precipitation events or from fire suppression efforts during the 1968 dip-tank fire. All three composite surface soil samples (C-17-U, C-18-U, C-19-U) collected from these areas were non-detect for PCP, suggesting that PCP is not being carried off site in surface waters.

PCP was also analyzed by EPA Method 8270D and was detected in three samples. PCP in sample SP01-1 reported similar concentrations (0.664 and 0.94 mg/kg) between the 8270D and 8151 methods. Similarly, Sample SP02-1 had comparable concentrations of 0.485 and 0.1 mg/kg for the 8270D and 8151 methods. However, there was a substantial difference in sample SP03-1, which reported a EPA Method 8151 concentration of 16.8 mg/kg compared to the Method 8270D reported concentration of 2.78 mg/kg. However, the 8151 result was flagged J+ based on matrix effects on surrogate recovery.

DIOXINS AND FURANS

Dioxin and furan congeners were analyzed in 50 surface soil samples at the Facility. Of the 50 surface soil samples, four were excavation test pit samples and 46 were surface soil composite samples. Of the 46 surface soil composite samples, 17 were collected on the Kodiak Concrete property south of the landfill, and six were collected on the Judith Shadows property north and east of the landfill. **Table 11 (Appendix B)** presents the data. **Figures 24** and **25 (Appendix A)** show Dioxin/Furan TEQ concentrations in surface soils at the Facility.

Tetra Tech did not calculate a site-specific PGW screening level for the dioxin/furan TEQ. A TEQ was calculated for each surface soil sample using the DEQ dioxin/furan TEQ calculator (DEQ 2005) and was screened against screening levels for 2,3,7,8-tetrachlorodibenzo-p-dioxin. Of the 50 samples analyzed, 32 exceeded one or more screening level.

TEQ values for excavation test pit samples ranged from 193.7 nanograms per kilogram (ng/kg) to 2,926.8 ng/kg. Sample SP12-1 exhibited the highest TEQ value of 2,926.8 ng/kg, which was collected from a sample depth interval of 1.5 to 2.0 feet.

- Four excavation test pit samples exceeded the residential DC screening level of 4.80 ng/kg, the industrial DC screening level of 22.0 ng/kg, and the construction DC screening level of 45.54 ng/kg, with concentrations ranging from 193.7 to 2926.8 ng/kg;
- Four excavation test pit samples exceeded the generic PGW screening level of 9.83 ng/kg, with concentrations ranging from 193.7 to 2926.8 ng/kg.

TEQ values in surface soil composite samples ranged from 0.96 to 370 ng/kg. The highest TEQ value was 370 ng/kg in sample C-8U, which was collected from a depth interval of 0 to 6 inches.

- 28 surface soil composite samples exceeded the residential DC screening level of 4.80 ng/kg, with concentrations ranging from 4.9 to 370 ng/kg;
- 19 surface soil composite samples exceeded the industrial DC screening level of 22.0 ng/kg, with concentrations ranging from 23.0 to 370 ng/kg;
- 10 surface soil composite sample exceeded the construction DC screening level of 45.54 ng/kg, with concentrations ranging from 45.8 to 370 ng/kg;
- 23 surface soil composite samples exceeded the generic PGW screening level of 9.83 ng/kg, with concentrations ranging from 18.0 to 370 ng/kg.

Dioxin/furan concentrations exceeded screening levels in surface soils across the entire landfill area, and in some locations east and south of the landfill property.

TEQ values for the Kodiak Concrete property (included in the above discussion) ranged from 0.95 to 40.5 ng/kg, with a median value of 3.4 ng/kg. Seven of the Kodiak Concrete property soil samples exceeded one or more screening levels. Five of samples exceeded the industrial DC screening level of 22.00 ng/kg.

TEQ values for six composite samples collected on the Judith Shadows property north of the landfill (C-36U, C-37U, C-41U, and C-37L) ranged from 1.2 to 2.9 ng/kg and were below all screening levels. Dioxin concentrations in surface soil composite samples C-39U and C-34U on the Judith Shadows property east of the landfill had TEQ values of 4.9 and 7.8 ng/kg. These values are above the residential DC screening level of 4.8 ng/kg and are included in bulleted totals above.

EXTRACTABLE AND VOLATILE PETROLEUM HYDROCARBONS

EPH and VPH were analyzed in 16 surface soil samples from the landfill property, including 13 excavation test pit samples and three surface soil composite samples. EPH fractionation was performed on one excavation test pit sample and one surface soil composite sample; **Table 12 (Appendix B)** presents the results.

- Excavation test pit sample SP03-1 (location SP03, **Figure 10, Appendix A**) for the 2.3 to 2.8 feet depth interval exhibited an aliphatic (C09-C18) concentration of 147 mg/kg, above the residential DC screening level of 110 mg/kg;
- Surface soil composite sample SS02 for the 0- to 6-inch depth interval (**Figure 11, Appendix A**) exhibited an aliphatic (C09-18) concentration of 6.2 mg/kg, below all soil screening levels.

SEMIVOLATILE ORGANIC COMPOUNDS

Benzo(b)fluoranthene

Benzo(b)fluoranthene was analyzed in 16 surface soil samples collected from the landfill property. Of the 16 surface soil samples, 13 samples were excavation test pit samples and three were surface soil composite samples. Benzo(b)fluoranthene was detected in one excavation test pit sample but was not detected in any of the surface soil composite samples. **Table 13 (Appendix B)** presents the analytical results.

- Excavation test pit soil sample (SP06-1; location SP06, **Figure 10, Appendix A**) collected from 1.0 to 1.5 feet bgs exceeded the Benzo(b)fluoranthene residential screening level of 0.18 mg/kg, with a concentration of 0.19 mg/kg;
- No surface soil composite samples exceeded any benzo(b)fluoranthene screening levels.

Pentachlorophenol (PCP)

All samples analyzed for PCP by the EPA 8270 method were also analyzed by EPA 8151, and the results are discussed in the Herbicides/Pesticides section, above.

VOLATILE ORGANIC COMPOUNDS

VOCs were analyzed in 20 surface soil samples from the landfill property, including 19 soil excavation test pits and one surface soil composite sample (PCE-6). **Table 14 (Appendix B)** presents the results. **Figure 10 (Appendix A)** shows the sample locations for the excavation test pits. Surface soil composite sample PCE-6 was collected at 0 to 6 inches at sampling locations PCE-1 through PCE-5 shown of **Figure 10 (Appendix A).**

Methylene chloride

Methylene chloride was detected in four soil samples, with concentrations ranging from 0.0224 (J+) to 0.0417 mg/kg, which exceeded the generic PGW screening level of 0.013 mg/kg. Methylene chloride was detected in one method blank at a concentration of 0.0174 mg/kg, which indicates the result for sample SP08-1 (0.0224 mg/kg) is estimated and potentially biased high. Results for the surface soil composite sample did not exceed any methylene chloride screening levels.

Sample SP09-1 exhibited the highest methylene chloride concentration of 0.0417 mg/kg from a sampling depth interval of 0.2 to 0.7 foot. Sample SP13-1 was a duplicate of the same location and had a reported concentration of 0.0286 mg/kg.

Tetrachloroethene

Tetrachloroethene was detected in one of the 19 excavation pit samples. Sample SP11-1 was collected from the depth interval 0.06 to 1.0 foot and exhibited a tetrachloroethene concentration of 0.212 mg/kg, above the generic PGW screening level.

Tetra Tech conducted additional sampling to evaluate whether tetrachloroethene was present in soils in the vicinity of sample SP09-1. Follow-up sampling included the collection of surface soil composite samples PCE-1 through PCE-6.

- Surface soil composite sample PCE-1 was collected as a four-point subsample composite from a sampling depth of 1 to 2 feet. The four subsample locations were located in cardinal directions approximately 2 feet from the SP11 sampling location. Tetrachloroethene was not detected in the surface soil composite sample.
- Excavation test pit samples PCE-2 through PCE-5 were collected at a distance of 20 feet in the cardinal directions from the SP11 sampling location and from a sampling depth of 1 to 2 feet. Tetrachloroethene was not detected in any of the excavation pit samples.

2.9.8.4 Subsurface Soil Analytical Results

The following sections present the subsurface soil analytical results for soil borings and test pits. **Section 2.9.2** specifies the soil analytical methods. Soil boring sample designations begin with “SB” and excavation test pit sample designations begin with “SP” in the below text and in **Tables 15** through **20 (Appendix B)**. Excavation test pit samples are composite soil samples made up of five subsamples (see Section 2.9.1). Analytical results were compared with the BTV, construction worker DC screening level, and PGW screening levels. EPH and VPH results were compared with RBCA soil screening levels.

METALS

Metals were analyzed in 38 subsurface soil samples collected from the landfill property (see Section 2.9.4.1). These samples included:

- Seven subsurface soil composite samples from soil excavation test pits;
- 14 samples from soil borings from depths of 4 to 8 feet;
- 14 samples from soil borings at the bottom of the landfill (waste-native contact); and
- Three samples from soil borings collected from bedrock at the water-bearing zone.

Arsenic

All residential and industrial DC and PGW screening levels are lower than the BTV, so the BTV was used for initial screening. Samples that exceed the BTV were also evaluated against PGW screening levels. **Table 15 (Appendix B)** presents the results. **Figure 26 (Appendix A)** show the distribution of arsenic concentrations in subsurface soils at depths of 2 to 10 feet bgs at the Facility.

- Arsenic concentrations in the seven subsurface soil composite samples collected from excavation test pits ranged in concentration from 6.7 to 14.3 mg/kg. Sample depths ranged from 2.2 to 4.1 feet. Arsenic concentrations in these samples did not meet or exceed the BTV of 22.5 mg/kg.
- 14 soil boring samples were collected from depths of 4 to 8 feet. Arsenic concentrations in these samples ranged from 12.0 to 53.8 mg/kg. Sample SB06-1 exhibited the highest concentration of 53.8 mg/kg from the sampling depth interval of 6 to 8 feet.
- Arsenic concentrations in six of the 14 soil boring samples collected from 4 to 8 feet bgs ranged from 25.7 to 53.8 mg/kg, which exceeded the arsenic BTV of 22.5 mg/kg, generic PGW of 2.9

mg/kg, and site-specific PGW of 0.015 mg/kg. The samples that exceeded the arsenic BTV in subsurface soils from 4 to 8 feet bgs were not spatially correlated.

- 14 soil borings samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. Arsenic concentrations in these soil samples ranged from 3.4 to 17.5 mg/kg. None of the samples collected from the bottom of landfill exceeded the arsenic BTV.
- Three soil boring (shale bedrock) samples were collected from the water-bearing zone at depths from 22 to 51 feet bgs. Arsenic concentrations in these samples ranged from 5.5 to 6.1 mg/kg and did not exceeded the BTV.

Cadmium

Cadmium exceeded one or more screening levels in seven subsurface soil samples. Results are presented in **Table 15 (Appendix B). Figures 27** and **28 (Appendix A)** show cadmium concentrations in soils at depths of 4 to 8 feet and greater than 10 feet bgs.

- Cadmium concentrations in soil samples from the seven excavation test pits ranged in concentration from 0.33 to 1 mg/kg. Sample depths ranged from 2.2 to 4.1 feet. None of the subsurface soil composite samples from the soil excavation test pits exceeded cadmium screening levels.
- 14 soil boring samples were collected from sampling depths of 4 to 8 feet bgs. Cadmium concentrations in these samples ranged from 0.28 to 9.4 mg/kg. Sample SB18-1 exhibited the highest concentration of 9.4 mg/kg from the sampling depth interval of 6 to 8 feet bgs.
    - Five soil samples collected from 4 to 8 feet bgs had cadmium concentrations ranging from 5.7 to 8.5 mg/kg, which exceeded the BTV of 0.7 mg/kg and the generic PGW of 3.8 mg/kg. The samples that exceeded the cadmium generic PGW screening level in subsurface soils from 4 to 8 feet bgs were not spatially correlated.
- 14 soil borings samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. Cadmium concentrations in these samples ranged from non-detect to 6.6 mg/kg.
    - Soil boring samples SB11-2 (30 to 32 feet) and SB13-2 (34 to 36 feet) had cadmium concentrations ranging from 6.6 to 3.8 mg/kg. These concentrations exceeded the BTV of 0.7 mg/kg and met or exceeded the generic PGW of 3.8 mg/kg. The locations of the samples that exceeded the cadmium generic PGW screening level in subsurface soils from depths greater than 10 feet bgs were not spatially correlated.
- Three soil boring (shale bedrock) samples were collected from the water-bearing zone at depths of 22 to 51 feet bgs. Cadmium concentrations in these samples ranged from 0.08 to 0.047 mg/kg and did not exceed screening levels.

Lead

Lead exceeded one or more screening levels in 19 subsurface soil samples. **Table 15 (Appendix B)** presents the results. **Figures 29 and 30 (Appendix A)** show lead concentrations at soil depths of 4 to 8 feet and greater than 10 feet bgs.

- Lead in the seven subsurface soil composite samples from the excavation test pits ranged in concentration from 8.5 to 124 mg/kg and included soils collected from depths of 2.2 to 4.1 feet bgs. None of the subsurface soil composite samples from the excavation test pits exceeded screening levels.

- 14 soil boring samples were collected from a sampling depth of 4 to 8 feet bgs. Lead concentrations in these samples ranged from 29 to 1,180 mg/kg. Sample SB18-1 exhibited the highest concentration of 1,180 mg/kg from the sampling depth interval of 4 to 6 feet.
    - 13 soil boring samples collected from 4 to 8 feet bgs exceeded the construction worker DC screening level and generic PGW screening level of 140 mg/kg, with concentrations ranging from 237 to 1,180 mg/kg. Five of these samples also exceeded the site-specific PGW of 478 mg/kg, with concentrations ranging from 519 to 1180 mg/kg.
- 14 soil borings samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. Lead concentrations in these samples ranged from 11.8 to 1,870 mg/kg. Sample SB09-2 exhibited the highest concentration of 1,870 mg/kg at a sample depth interval of 30 to 32 feet bgs.
    - Six soil boring samples from depths greater than 10 feet exceeded the generic PGW screening level of 140 mg/kg, with concentrations ranging from 154 mg/kg to 1,870 mg/kg. Two of these samples also exceeded the site-specific PGW screening level of 478 mg/kg, with concentrations ranging from 795 to 1,870 mg/kg.
- 3 soil boring (shale bedrock) samples were collected from the water-bearing zone at a depth of 22 to 51 feet bgs. Lead concentrations in these samples ranged from 11.8 to 14.7 mg/kg and did not exceed screening levels.

Lead exceeds the generic PGW and construction DC screening levels in subsurface soils at depths of 4 to 8 feet bgs across most of the landfill area, with the exception of sample SB05-1, located in the southwestern corner of the landfill property. The area where lead exceeds these screening levels totals approximately 2.7 acres. The samples that exceeded the site-specific PGW screening level in subsurface soils at depths of 4 to 8 feet bgs are not spatially correlated, but are found primarily in the central and eastern portions of the landfill property.

Samples that exceeded the site-specific PGW screening level (SB09-2 and SB13-2) are located in the west-central portion of the landfill property and in the deepest portion of the landfill (**Figure 9**). These locations are also correlated with the highest concentrations of mercury observed from samples at the bottom on the landfill.

Mercury

Mercury exceeded one or more screening levels in two subsurface samples. Results are presented in **Table 15 (Appendix B). Figure 31 (Appendix A)** shows mercury concentrations in subsurface soils at depths of greater than 10 feet bgs.

- Mercury concentrations in the seven subsurface soil composite samples from the excavation test pits ranged from 0.014 to 0.073 mg/kg and included soils collected from depths of 2.2 to 4.1 feet bgs. None of the subsurface soil composite samples from the excavation test pits exceeded screening levels.
- 14 soil boring samples were collected from a sampling depth of 4 to 8 feet bgs. Mercury concentrations in these samples ranged from 0.019 to 0.74 mg/kg. None of the subsurface soil boring samples from depths of 4 to 8 feet bgs exceeded screening levels.
- 14 soil borings samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. Mercury concentrations in these samples ranged from 0.013 to 4.1 mg/kg. Sample SB09-2 exhibited the highest concentration of 4.1 mg/kg at a sample depth interval of 30 to 32 feet bgs.

- Two soil boring samples from depths of 30 to 36 feet bgs exceeded the generic PGW screening level of 1 mg/kg, with concentrations ranging from 2.5 to 4.1 mg/kg.

- Three soil boring (shale bedrock) samples were collected from the water-bearing zone at a depth of 22 to 51 feet bgs. Mercury concentrations in these samples ranged from 0.019 to 0.024 mg/kg and did not exceed screening levels.

The two soil boring samples to exceed the generic PGW screening level (SB13-2 and SB09-2) are located adjacent to one another in the west-central and deepest portion of the landfill. These locations are also correlated with the highest concentrations of lead observed from samples at the bottom on the landfill.

Selenium

Selenium exceeded one screening level in one subsurface sample. **Table 15 (Appendix B)** presents the results.

- Selenium concentrations in the seven subsurface soil composite samples from the excavation test pits ranged in concentration from non-detect to 0.55 mg/kg and include soils collected from depths of 2.2 to 4.1 feet bgs. Concentrations did not exceed any screening level.
- 14 soil boring samples were collected from a sampling depth of 4 to 8 feet bgs. Selenium concentrations in these samples ranged from non-detect to 0.74 mg/kg. None of the subsurface soil boring samples from depths of 4 to 8 bgs feet exceeded screening levels.
  - Sample SB07-1, collected from 6 to 8 feet bgs, exhibited the highest concentration of selenium at 4.9 mg/kg, which exceeded the BTV of 0.7 mg/kg and generic PGW screening level of 2.6 mg/kg.
- 14 soil borings samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. Selenium concentrations in these samples ranged from non-detect to 1.2 mg/kg. Sample SB13-2 (34 -36-feet) exceeded the BTV of 0.7 but did not exceed any other soil screening level.
- Three soil boring (shale bedrock) samples were collected from the water-bearing zone at a depth of 22 to 51 feet bgs. Selenium was not detected in these samples.

HERBICIDES/PESTICIDES

Herbicides / pesticides were analyzed in 38 subsurface soil samples collected from the landfill property (see Section 2.9.4.1). These samples included:

- Seven subsurface soil composite samples from excavation test pits;
- 14 samples from soil borings from depths of 4 to 8 feet bgs;
- 14 samples from soil borings at the bottom of the landfill (waste-native contact); and
- Three samples from soil borings collected from bedrock at the water-bearing zone at a depth of 22 to 51 feet bgs.

2-Methyl-4-Chlorophenoxyacetic Acid (MCPA)

MCPA exceeded one or more screening levels in one subsurface soil sample. **Table 16 (Appendix B)** presents the results.

- MCPA was not detected in surface soil composite samples from excavation test pits.

- 14 soil boring samples were collected from a sampling depth of 4 to 8 feet bgs. MCPA concentrations in these samples ranged from non-detect to 27.4 mg/kg. MCPA was detected in two samples, with soil sample SB08-1 exhibiting the highest concentration of 27.4 mg/kg at a sampling depth interval of 6 to 8 feet bgs.
    - o Two soil boring samples from depths of 6 to 8 feet bgs exceeded the generic PGW screening level of 0.008 mg/kg, with sample concentrations ranging from 6.86 to 27.4 mg/kg. Sample SB08-1 (27.4 mg/kg) also exceeded the construction DC screening level of 27 mg/kg.
- 14 soil boring samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. MCPA concentrations in these samples ranged from non-detect to 100 mg/kg. MCPA was detected in two samples.
    - o Sample SB07-2 had the highest concentration of 100 mg/kg at a sampling depth interval of 12to 14 feet bgs, which exceeded the industrial and construction DC screening levels.
    - o Soil boring samples SB07-2 (100 mg/kg) and SB09-2 (10.1 mg/kg) exceeded the generic PGW screening level for MCPA of 0.008 mg/kg.
- Three soil boring (shale bedrock) samples were collected from the water-bearing zone at a depth of 22 to 51 feet. MCPA was not detected in these samples.

Pentachlorophenol (PCP)

PCP exceeded one or more screening levels in nine subsurface samples. **Table 16 (Appendix B)** presents the results. **Figure 32 (Appendix A)** shows PCP concentrations in subsurface soils from depths of 2 to 10 feet bgs.

- PCP in the seven subsurface soil composite samples from excavation test pits ranged from non-detect to 2 mg/kg. Sample SP03-2 exhibited the highest concentration of 2.0 mg/kg at the depth interval of 2.3 to 2.8 feet. However, this sample was qualified (J+) and potentially biased high because of matrix effects on surrogate recovery. PCP was detected in five of the seven excavation test pits.
    - o Four composite samples from depths of 2.1 to 4.1 feet bgs exceeded the generic PGW screening level of 0.014 mg/kg, with concentrations ranging from 0.22 to 2 mg/kg.
    - o Of the four samples that exceeded the generic PGW screening level, two (SP01-2 and SP03-2) were located near the location of the historical PCP dip-tank and two (SP06-2 and SP08-2) were located near the area where PCP treated logs were piled in the late 1960s and early 1970s.
    - 14 soil boring samples were collected from a sampling depth of 4 to 8 feet bgs. PCP concentrations in these samples ranged from non-detect to 0.0299 mg/kg.
        - o PCP was detected in 10 samples. Sample SB17-2 exhibited the highest concentration of 0.0299 mg/kg at a sampling depth interval of 6 to 8 feet bgs.
        - o Four soil boring samples collected from 4 to 8 feet bgs exceeded the generic PGW screening level of 0.014 mg/kg, with concentrations ranging from 0.0236 mg/kg to 0.0299 mg/kg.
- 14 soil borings samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. PCP concentrations in these samples ranged from non-detect to 0.01 mg/kg. PCP was detected in three samples, but all sample concentrations were below PCP screening levels.

- Three soil borings (shale bedrock) samples were collected from the water-bearing zone at a depth of 22 to 51 feet bgs. PCP was not detected in these samples.

PCP was also analyzed by EPA Method 8270D and was detected in sample SP01-2 and SP03-2. Results for these samples (0.385 and 2.31 mg/kg) were similar to results from EPA Method 8151 (0.44 and 2.0 mg/kg).

DIOXINS AND FURANS

Dioxin and furan congeners were analyzed in 33 subsurface soil samples at the landfill property. These samples included:

- Two subsurface soil composite samples from soil excavation test pits;
- 14 samples from soil borings from depths of 4 to 8 feet bgs;
- 14 samples from soil borings at the bottom of the landfill (waste-native contact); and
- Three samples from soil borings collected from bedrock at the water-bearing zone.

A TEQ was calculated for each sample using the DEQ dioxin/furan TEQ calculator (DEQ 2005) and the TEQ was compared to screening levels for 2,3,7,8-tetrachlorodibenzo-p-dioxin. Of the 33 samples analyzed, 13 exceeded one or more screening levels. Results are provided in **Table 17 (Appendix B)**. **Figure 33 (Appendix A)** shows Dioxin/Furan TEQ concentrations in subsurface soils on the landfill property at depths of 2 to 10 feet bgs. A site-specific PGW screening level was not calculated for dioxin and furan TEQ.

- TEQ values in the two subsurface soil composite samples from the excavation tests ranged from 159.3 to 170 ng/kg. Sample SP03-2 exhibited the highest concentration of 170.9 ng/kg at the depth interval of 2.3 to 2.8 feet.
    - Two subsurface soil composite samples from the excavation test pits exceeded the construction worker DC screening level of 45.54 mg/kg and generic PGW screening level of 9.83 ng/kg.
- 14 soil boring samples were collected from a sampling depth of 4 to 8 feet bgs. TEQ concentrations in these samples ranged from 1.9 to 866.3 ng/kg.
    - Sample SB09-1 exhibited the highest concentration of 866.3 ng/kg at a sampling depth interval of 4 to 6 feet bgs.
    - 11 soil boring samples collected from 4 to 8 feet bgs exceeded the generic PGW screening level of 9.83 ng/kg, with concentrations ranging from 12.5 to 866.3 ng/kg.
    - Four of the 11 soil samples that exceeded the generic PGW also exceeded the construction worker DC screening level of 45.54 ng/kg, with concentrations ranging from 66.9 to 866.3 ng/kg.
    - Dioxin and furan TEQ values exceed screening levels in subsurface soils from depths of 2 to 8 feet bgs across most of the historical landfill.
- 14 soil borings samples were collected from the bottom of the landfill at sampling depths of 9 to 36 feet bgs. TEQ concentrations in these samples ranged from 0.9 to 5.7 ng/kg. All sample concentrations were below dioxin and furan TEQ screening levels.
- Three soil boring (shale bedrock) samples were collected from the water-bearing zone at a depth of 22 to 51 feet bgs. Calculated TEQ values for these samples were 0.1 ng/kg, below all screening levels.

EXTRACTABLE AND VOLATILE PETROLEUM HYDROCARBONS

No analytes were detected above screening levels. Results are presented in **Table 18 (Appendix B).**

SEMIVOLATILE ORGANIC COMOUNDS

Results of SVOCs analyses are presented in **Table 19 (Appendix B).** No analytes exceeded screening levels, with the exception of PCP. All samples analyzed for PCP by EPA Method 8270D were also analyzed by EPA Method 8151; the results are discussed above in the Herbicides/Pesticides section.

VOLATILE ORGANIC COMPOUNDS

Methylene chloride

Methylene chloride was analyzed for in 10 subsurface soil samples at the landfill property. These samples included:

- Seven subsurface soil composite samples from excavation test pits;
- Three samples from soil borings collected from bedrock at the water-bearing zone.

Methylene chloride exceeded the generic PGW of 0.013 mg/kg in three composite samples from the excavation test pits and one soil boring sample with concentrations ranging from 0.0167 to 0.0914 mg/kg. Results for the three composite samples from the excavation test pits were qualified as estimated (J+) and potentially biased high because of methylene chloride in laboratory blanks, and the soil boring result was also qualified as estimated. Methylene chloride is a common laboratory contaminant. The detection of methylene chloride in subsurface soil samples is considered a result of laboratory contamination. The Phase II investigation report (Tetra Tech 2016a) discusses this issue further. **Table 20 (Appendix B)** presents the results.

2.9.8.5 Non-detected Analytes in Surface and Subsurface Soils

There are 55 analytes that were analyzed in surface and subsurface soils that had PQLs greater than one or more screening levels that were not detected at the Facility. Of the 55 analytes, 25 were analytes from the EPA 8270D method (SVOCs), 25 were analytes from the EPA 8260B method (VOCs), and five were from the EPA 8151 method (Herbicides). **Table 2.9-6** summarizes the analytes, analytical methods, screening levels, PQLs, and MDLs for these analytes.

None of the 55 analytes was included as a primary COPC identified during development of the SAP at the Facility. In many cases, the MDL is substantially lower than the PQLs and screening levels, suggesting that many of these analytes would have been detected if present. An exception is that generic PGW screening levels for some PAHs are well below MDLs (for example, benzo(a)pyrene). Additionally, none of the analytes was detected in groundwater samples. Because these analytes were not detected in the areas of the Facility associated with PCP pole treatment (dip-tank) and PCP post drying, they are not likely to occur at the Facility as a result of the PCP post treatment operations.

Table 2.9-6. Non-Detected Analytes with PQLs Greater than Screening Levels

Analyte	Method	Screening levels (mg/kg)				MDL (mg/kg)	PQL (mg/kg)
		Res. DC	**Ind. DC**	**Const. DC**	**Generic PGW**		
Benzo(a)anthracene	EPA 8270D	0.18	3.2	54	6.8/35	0.183 - 0.962	0.367 - 1.92
Benzo(a)pyrene	EPA 8270D	0.018	0.32	5.4	2.3/12	0.183 - 0.962	0.367 - 1.92
Butylbenzylphthalate	EPA 8270D	290	1200	-	0.15	0.183 - 0.962	0.367 - 1.92
4-Chloroaniline	EPA 8270D	2.7	11	-	0.0016	0.0562 - 0.295	0.367 - 1.92
bis(2-Chloroethoxy)methane	EPA 8270D	19	250	-	0.13	0.0717 - 0.376	0.367 - 1.92
bis(2-Chloroethyl) ether	EPA 8270D	0.23	1	32.2	0.000771	0.0256 - 0.134	0.367 - 1.92
2-Chlorophenol	EPA 8270D	39	580	-	0.293	0.0856 - 0.449	0.367 - 1.92
Dibenz(a,h)anthracene	EPA 8270D	0.018	0.32	5.4	38	0.183 - 0.962	0.367 - 1.92
3,3'-Dichlorobenzidine	EPA 8270D	1.2	5.1	93.7	0.0309	0.0511 - 0.268	0.367 - 1.92
2,4-Dichlorophenol	EPA 8270D	19	250	-	0.05	0.069 - 0.362	0.367 - 1.92
4,6-Dinitro-2-methylphenol	EPA 8270D	0.51	6.6	5.4	0.0347	0.0729 - 0.382	1.89 - 9.91
2,4-Dinitrophenol	EPA 8270D	13	160	-	0.113	0.183 - 0.962	0.367 - 1.92
2,4-Dinitrotoluene	EPA 8270D	1.7	7.4	134.4	0.00653	0.183 - 0.962	0.367 - 1.92
2,6-Dinitrotoluene	EPA 8270D	0.36	1.5	20.3	0.00684	0.0313 - 0.164	0.367 - 1.92
1,2-Diphenylhydrazine	EPA 8270D	0.68	2.9	52.7	0.00962	0.183 - 0.962	0.367 - 1.92
Hexachloro-1,3-butadiene	EPA 8270D	1.2	5.3	89.2	0.0964	0.0213 - 0.162	0.25 - 1.92
Hexachlorobenzene	EPA 8270D	0.21	0.96	25.9	0.0245	0.0482 - 0.253	0.367 - 1.92
Hexachloroethane	EPA 8270D	1.8	8	40.4	0.182	0.0233 - 0.122	0.367 - 1.92
Indeno(1,2,3-cd)pyrene	EPA 8270D	0.18	3.2	54	77/380	0.183 - 0.962	0.367 - 1.92
4-Nitroaniline	EPA 8270D	27	110	-	0.016	0.0321 - 0.168	0.367 - 1.92
Nitrobenzene	EPA 8270D	5.1	22	-	0.0657	0.0741 - 0.389	0.367 - 1.92
N-Nitrosodimethylamine	EPA 8270D	0.002	0.034	0.5	1.69E-05	0.183 - 0.962	0.367 - 1.92
N-Nitroso-di-n-propylamine	EPA 8270D	0.078	0.33	6	0.000368	0.0499 - 0.262	0.367 - 1.92
2,4,6-Trichlorophenol	EPA 8270D	49	210	-	0.293	0.0472 - 0.248	0.367 - 1.92
Di-n-butylphthalate	EPA 8270D	630	8200	-	0.511	0.0509 - 0.267	0.367 - 1.92
Allyl chloride	EPA 8260B	0.72	3.2	-	0.0023	0.0122 - 0.0551	0.2 - 0.264
Bromodichloromethane	EPA 8260B	0.29	1.3	-	0.0277	0.0089 - 0.018	0.05 - 0.257
Bromoform	EPA 8260B	19	86	-	0.211	0.0119 - 0.0554	0.2 - 0.642
Bromomethane	EPA 8260B	0.68	3	-	0.0253	0.0507 - 0.116	0.5 - 0.661
Carbon tetrachloride	EPA 8260B	0.65	2.9	-	0.0117	0.0121 - 0.0202	0.05 - 0.0661
1,2-Dibromo-3-chloropropane	EPA 8260B	0.0053	0.064	3.5	0.00086	0.0387 - 0.125	0.5 - 0.661
Dibromochloromethane	EPA 8260B	8.3	39	-	0.0211	0.0077 - 0.0551	0.2 - 0.264
1,2-Dibromoethane (EDB)	EPA 8260B	0.04	0.18	7.8	0	0.008 - 0.0241	0.05 - 0.0661
Dibromomethane	EPA 8260B	2.4	9.9	-	0.021	0.0118 - 0.025	0.05 - 0.0661
1,1-Dichloroethane	EPA 8260B	3.6	16	-	0.0078	0.0096 - 0.0249	0.05 - 0.0661
1,1-Dichloroethene	EPA 8260B	23	100	-	0.025	0.0114 - 0.0163	0.05 - 0.0661

Table 2.9-6. Non-Detected Analytes with PQLs Greater than Screening Levels (Cont.)

Analyte	Method	Screening levels (mg/kg)				MDL (mg/kg)	PQL (mg/kg)
		Res. DC	**Ind. DC**	**Const. DC**	**Generic PGW**		
1,2-Dichloropropane	EPA 8260B	1	4.4	-	0.017	0.0102 - 0.0222	0.05 - 0.0661
1,1,1,2-Tetrachloroethane	EPA 8260B	2	8.8	-	0.0022	0.0096 - 0.0254	0.05 - 0.0661
1,1,2,2-Tetrachloroethane	EPA 8260B	0.6	2.7	-	0.00789	0.0096 - 0.0143	0.05 - 0.257
1,1,2-Trichloroethane	EPA 8260B	1.1	5	-	0.00954	0.0108 - 0.0181	0.05 - 0.0661
Trichloroethene	EPA 8260B	0.94	6	-	0.018	0.0121 - 0.0184	0.05 - 0.0661
1,2,3-Trichloropropane	EPA 8260B	0.0051	0.11	4.1	3.20E-06	0.0138 - 0.0665	0.2 - 0.264
Vinyl chloride	EPA 8260B	0.059	1.7	-	0.000684	0.0064 - 0.0119	0.02 - 0.0264
bis(2-Chloroisopropyl) ether	EPA 8270D	310	4700	-	0.732	0.0847 - 0.444	0.367 - 1.92
Dibenzofuran	EPA 8270D	7.3	100	-	1.5	0.183 - 0.962	0.367 - 1.92
1,4-Dichlorobenzene	EPA 8270D	2.6	11	-	0.72	0.0106 - 0.128	0.05 - 1.92
2,4-Dimethylphenol	EPA 8270D	130	1600	-	1.17	0.0687 - 0.36	0.367 - 1.92
Isophorone	EPA 8270D	570	2400	-	1.33	0.0586 - 0.307	0.367 - 1.92
2-Nitroaniline	EPA 8270D	63	800	-	0.8	0.0398 - 0.209	0.367 - 1.92
N-Nitrosodiphenylamine	EPA 8270D	110	470	-	1.84	0.183 - 0.962	0.367 - 1.92
Dalapon	EPA 8151	190	2500	-	0.41	0.0061 - 0.082	0.03 - 0.41
2,4-DB	EPA 8151	51	660	-	1.1	0.017 - 3.97	0.063 - 7.94
Dicamba	EPA 8151	190	2500	-	0.526	0.0013 - 1.59	0.0031 - 3.17
2,4,5-T	EPA 8151	63	820	-	0.298	0.0016 - 1.59	0.0063 - 3.17
2,4,5-TP (Silvex)	EPA 8151	51	660	-	0.28	0.00079 - 1.59	0.0063 - 3.17

References for direct contact and protection of groundwater screening levels provided in Section 2.9.5
Const. DC - Construction direct contact
MDL - Method detection limit
mg/kg – milligram/kilogram
Res. DC - Residential direct contact
EPA - Environmental Protection Agency
PGW - Protection of groundwater
Ind. DC - Industrial direct contact
PQL - Practical quantitation limit
8270D - Semivolatile organic compounds by gas chromatography/mass spectrometry
8270B - Volatile organic compounds by gas chromatography/mass spectrometry
8151 - Chlorinated herbicides by gas chromatography

2.9.9 Groundwater Investigation

This section discusses groundwater monitoring well installation and groundwater monitoring. **Appendix I** includes copies of the 2016 and 2017 SAPs and addendums. **Appendix J** provides copies of field notes, groundwater sampling forms, and well logs. **Appendix K** includes a photograph log. **Appendix L** includes copies of all laboratory reports, validation reports, and the electronic database of sample results.

Five monitoring wells were installed at the Facility in 2016 and 2017. In February 2016, O'Keefe Drilling of Butte, Montana, drilled and installed the first three wells using a hollow-stem auger drill rig. These wells are named GW01, GW02, and GW03, and DEQ selected their locations during the initial site investigation (Tetra Tech 2016b). The fourth well, named MW05, was drilled and installed by Boland Drilling of Great Falls, Montana, using an air-rotary drill rig, as per SAP Modification A (Tetra Tech 2016c). In February

2017, the fifth well, MW06, was installed by O'Keefe Drilling using a hollow-stem auger (as specified in the February 2017 SAP addendum) (Tetra Tech 2017a). **Figure 2** shows the location of the five wells installed at the Facility and adjacent properties. Table 2.3-4 presents a well construction summary.

Wells were installed in the following locations and for the following reasons (note: there is no well name MW/GW4):

- GW-01: Installed near the southwestern corner of the landfill to evaluate potential migration of contaminants from the landfill.
- GW02: Installed near the northwestern boundary of the landfill to evaluate potential migration of contaminants from the landfill.
- GW03: Installed on the landfill property, but northeast of the landfill in native soils and at a ground elevation approximately 35 feet lower than monitoring wells GW01 and GW02 to evaluate groundwater down-gradient from the Facility.
- MW05: Installed as a background well installed on the property adjoining and south of the Facility to document background conditions.
- MW06: Installed as a Down-gradient well located on the adjoining Weeden Ranch property to the northwest to evaluate potential down-gradient impacts. Well is located on the west side of Marcella Avenue, between the landfill and Breed Creek.

2.9.9.1 Field Screening, Logging, and Sample Collection

Field personnel collected soil boring samples (SB01-001, SB02-001, and SB03-001) at the water-bearing zone during installation of monitoring wells GW01, GW02, and GW03. **Section 2.9.8.4** discusses the analytical results from the three soil boring samples.

Split-spoon soil samples were collected at 5-foot depth intervals during installation of GW01, GW02, and GW03. Field personnel logged the lithology of the soil within each split-spoon sampler and field-screened the soil using a PID and heated headspace analysis to evaluate for potential volatile organic contamination. Soil cuttings were containerized and left on site pending laboratory analysis. Analysis of groundwater and soil boring samples indicated that all parameters were either non-detect, below DEQ-7 HHS (DEQ 2017a) or RBSLs (DEQ 2016b), or below soil screening levels (see Section 2.9.4.4). Based on the analytical results, soil cuttings were thin-spread on the ground around the monitoring wells in April 2017.

Soil boring samples were not collected during installation of monitoring wells MW05 and MW06. Monitoring well MW05 was located on the Kodiak property to the south and MW06 was located on the Weeden Ranch to the west, between the landfill and Breed Creek.

Monitoring well MW05 was installed using an air-rotary drill rig and did not produce cuttings to containerize. Lithology was logged at 5-foot depth intervals by collecting ejected soil and rock with a mesh screen and evaluating the recovered materials. Field personnel conducted field screening of soil using a PID every 10 to 15 feet during drilling.

Monitoring well MW06 was installed using a hollow stem auger. Since soil samples for laboratory analysis were not collected, a split-spoon sampler was not used. Lithology was logged as cuttings were ejected from the borehole. The top of the borehole was monitored with a PID at 5-foot intervals as auger flights were installed. Soil cuttings were also analyzed with a PID before they were containerized. The containerized cuttings were moved to the landfill property and held until groundwater results were obtained. The cuttings were then thin-spread on the landfill property near the former dip-tank location after groundwater results indicated all parameters were either non-detect or below DEQ-7 HHS and RBSLs.

2.9.9.2 Well Installation and Development

Table 2.9-7 presents a well construction summary for the wells installed at the Facility in 2016 and 2017.

Table 2.9-7. Well Construction Summary

Well Element	GW01	GW02	GW03	MW05	MW06
Date Completed	2/9/2016	2/11/2016	2/10/2016	10/06/2016	2/9/2017
Borehole Diameter (in)	8.5	8.5	8.5	8.5	8.5
Total Depth of Borehole (ft bgs)	51	69	25	43	38
Total Well Depth (ft bgs)	51	69	25	43	38
Surface Casing Diameter (in)	6	6	6	6	6
Surface Casing Material	Steel	Steel	Steel	Steel	Steel
Well Casing Diameter (in)	2	2	2	2	2
Well Casing Material	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC	Sch 40 PVC
Well Screen Material	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC	Factory-slotted Sch 40 PVC
Well Screen Slot Size (in)	0.020	0.020	0.020	0.020	0.020
Well Screen Interval (ft bgs)	41 - 51	59 - 69	15 - 25	23 - 43	28 - 38
Measuring Point Elevation (ft NAVD88)	4030.25	4025.71	3989.55	4024.78	3956.11
Northing Coordinate (NAD83)	47.07637284	47.07751248	47.07749908	47.07613041	47.07766
Easting Coordinate (NAD83)	109.4073	109.4072	109.4063	109.4061	109.4084

ft – feet in – inches bgs – below ground surface Sch – Schedule PVC – Polyvinyl chloride
NAD83 – North American Datum, 1983 NAVD88 – North American Vertical Datum, 1988
Wells surveyed by Stahly Engineering & Associates

The drilling contractors developed the monitoring wells using the surge and bail method as specified in the SAP (Tetra Tech 2016b, Tetra Tech SOP 021). Purge water was containerized pending analysis of groundwater. After the groundwater results indicated all parameters were either non-detect or were below DEQ-7 and RBSL groundwater standards, the purge water was discarded on the ground at the landfill. Purge water from wells GW01 and GW02 was spread in the vicinity of each well. Purge water from wells GW03, MW05, and MW06 was spread in the vicinity of the former dip-tank location on the landfill, rather than at the location where it was collected.

2.9.9.3 Groundwater Monitoring

Tetra Tech conducted groundwater monitoring events at the Facility during 2016 and 2017. Groundwater monitoring events were conducted as follows:

- Monitoring Wells GW01, GW02, and GW03 were sampled twice, once in February 2016 during low groundwater conditions and once in June 2016 during high groundwater conditions. In addition, static water levels were recorded in these wells during the October 2016 and February 2017 monitoring events when wells MW05 and MW06 were sampled.
- Monitoring well MW05 was sampled once in October 2016 during low groundwater conditions and the static water level (only) was recorded in February 2017.
- Monitoring well MW06 was sampled once in February 2017 during low groundwater conditions after the well was installed.

Groundwater was sampled in accordance with the SAP (Tetra Tech 2016b). Field personnel recorded the static water levels in wells prior to well purging using an electronic water level probe. **Table 2.9-8** presents the static water levels recorded at the Facility in 2016 and 2017.

Table 2.9-8. Static Water Levels – 2016 and 2017

Well	Date	Static Water Level (ft btoc)	Water Table Elevation (ft NAVD88)
GW01	2/22/2016	35.18	3995.07
	6/6/2016	32.84	3997.41
	10/27/2016	36.5	3993.75
	2/13/2017	34.23	3996.02
GW02	2/22/2016	52.81	3972.9
	6/6/2016	48.37	3977.34
	10/27/2016	55.5	3970.21
	2/13/2017	58.26	3967.45
GW03	2/22/2016	14.84	3974.71
	6/6/2016	12.9	3976.65
	10/27/2016	16.85	3972.7
	2/13/2017	14.69	3974.86
MW05	10/27/2016	26.71	4024.78
	2/13/2017	28.32	3996.46
MW06	2/9/2017	17.72	3938.39

ft – feet
btoc – below top of casing
NAVD88 – North American Vertical Datum, 1988

Field personnel sampled groundwater using a low-flow methodology employing a bladder pump system. Dedicated, disposable bladders and tubing were used to sample each well. Each well was purged until field parameters stabilized before a groundwater sample was collected. Field parameters monitored during purging included pH, specific conductance, oxidation-reduction potential, dissolved oxygen, and temperature **(Table 21, Appendix B)**. Field personnel collected groundwater samples in laboratory-provided sample bottles after field parameters had stabilized. Samples collected for metals analysis were field-filtered using disposable 0.45-micron in-line disposable water filters. Water purged during groundwater sampling was containerized in the same drums as purge water from well development.

2.9.9.4 Groundwater Analytical Results

The following sections present the analytical results for groundwater from the 2016 and 2017 monitoring events. **Section 2.9.2** presents the analytical methods used for groundwater. Only analytes that were detected at or above the laboratory PQL are discussed in this section. Most analytes were either not detected at, or above, the PQL, or were detected at concentrations lower than HHS or RBSLs. Dioxin and furan TEQ values were above the HHS, but concentrations were similar to associated field blank and laboratory method blank results**. Section 2.9.9.5** discusses analytes that were not detected, but had PQLs greater than the HHSs and RBSLs. Field parameters and static water levels are presented in **Table 21** (**Appendix B**).**Tables 22 through 27 (Appendix B)** present analytical results from groundwater sampling events.

METALS

The following discusses the groundwater results for metals. **Table 22 (Appendix B)** presents the groundwater results.

Arsenic

Six of the 10 groundwater samples collected (including duplicates) were non-detect at or above the PQL. Concentrations of arsenic ranged from non-detect to 3.3 micrograms per liter (µg/L) in groundwater samples, below the HHS of 10 µg/L. Arsenic concentrations above the MDL are as follows:

- The highest concentration was 3.3 µg/L in the June 2016 sample GW02-02; collected from the monitoring well located in the northwestern corner of the landfill.
- Sample MW05-1, collected from the upgradient monitoring well, had an arsenic concentration of 2.7 µg/L.
- Sample MW06-01, collected from the down-gradient well, had an arsenic concentration of 0.54 µg/L.

The arsenic PQL for all samples, except MW06-01, was 20 µg/L and exceeded the HHS of 10 µg/L. However, the maximum MDL for these samples was 4 µg/L, and arsenic was detected in (estimated) concentrations as low as 2.7 µg/L. This result suggests that the method was adequate to evaluate groundwater against the HHS.

Barium

Barium was detected at concentrations ranging from 21.9 to 128 µg/L in groundwater samples. Barium was detected in all groundwater samples collected from the Facility. All barium concentrations were below the HHS is 1,000 µg/L.

Cadmium

Cadmium was detected in groundwater samples at concentrations ranging from non-detect to 0.85 µg/L. Cadmium was detected in four of 10 groundwater samples, including duplicates. All cadmium concentrations were below the HHS of 5 µg/L.

Chromium

Chromium was not detected at or above the PQL in any groundwater samples collected from the Facility.

Lead

Lead was detected in one groundwater sample at a concentration of 0.1 µg/L, below the HHS of 15 µg/L. The sample was qualified as having been contaminated by the laboratory method blank. The remaining nine samples were non-detect with a PQL of 10 µg/L.

Dioxins and Furans

Dioxin and furan compounds in groundwater were screened by calculating a TEQ for each sample using the Montana DEQ TEQ calculator (DEQ 2005) and comparing the value against the HHS for 2,3,7,8-tetrachlorodibenzo-p-dioxin (2.0 picograms per liter [pg/L]). **Table 23 (Appendix B)** presents analytical results for dioxin and furan compounds.

Groundwater TEQ values ranged from 0.69 pg/L to 2.3 pg/L in the 10 groundwater samples collected from the Facility. Samples GW01-01 and GW04-1 exceeded the HHS of 2.0 pg/L, with concentrations of 2.28 and 2.29 pg/L. However, the field blank (FIELD BLANK 01) and laboratory method blank (BLANK 49191) associated with both of these samples had TEQ values of 2.3 and 1.9 pg/L. Given the similarity between the blank TEQ concentrations (1.9 to 2.3 pg/L), and groundwater sample TEQ concentrations (2.28 to 2.29 pg/L), dioxin and furan compounds are considered non-detect at concentrations above the HHS because of blank contamination.

EXTRACTABLE AND VOLATILE PETROLEUM HYDROCARBONS

Table 24 (Appendix B) presents the results of EPH and VPH analysis of groundwater. Eight EPH and VPH compounds/fractions were detected in groundwater, three of which were xylene (total or isomers).

Aromatic (C09 – C10) Compounds

Aromatic (C09 – C10) was detected in one groundwater sample from the Facility. Sample GW01-02 had a concentration of 0.82 µg/L, below the risk-based screening level (RBSL) of 1,100 µg/L. The sample was collected from well GW01 in the southeastern corner of the Facility. The analyte was not detected in the nine other groundwater samples.

Ethylbenzene

Ethylbenzene was detected in one groundwater sample at the Facility. Sample GW01-02 had a concentration of 0.41 µg/L, below the HHS of 700 µg/L. The sample was collected from well GW01 in the southeastern corner of the Facility. The analyte was not detected in the nine other groundwater samples.

Xylenes

Xylenes were detected in groundwater sample GW01-02, but were not detected in the remaining nine groundwater samples. Xylenes did not exceed the xylene HHS of 10,000 µg/L. Xylene concentrations in groundwater sample GW01-02 were as follows:

- m&p-xylene: 0.87 µg/L;
- o-xylene: 0.35 µg/L;
- total xylene was 0.87 µg/L.

Naphthalene

Naphthalene was detected in one groundwater sample at the Facility. Groundwater sample GW03-02 had a concentration of 0.29 µg/L, below the HHS of 100 µg/L. The sample was collected from monitoring well GW03, located at the northeast corner of the landfill property. The analyte was not detected in the nine other groundwater samples.

Total Extractable Hydrocarbons (TEH)

TEH was detected in two groundwater samples — one natural sample (MW05-01) and its corresponding duplicate (MW05-02). These groundwater samples were collected from well MW05, which is upgradient of the Facility. The TEH concentration in sample MW05-01 and MW05-02 was 163 and 126 µg/L. These concentrations were below DEQ's EPH screening concentration of 1,000 µg/L. A concentration above 1,000 µg/L would require EPH fractionation of the sample. The analyte was not detected in the eight other groundwater samples.

Total Purgeable Hydrocarbons (TPH)

TPH was detected in one groundwater sample at the Facility. Groundwater sample GW01-02 had a concentration of 2.9 µg/L, below the DEQ's TPH ceiling concentration of 1,000 µg/L. The sample was collected from well GW01 in the southeastern corner of the Facility. The analyte was not detected in the nine other groundwater samples.

Herbicides / Pesticides

Table 25 (Appendix B) presents the results of herbicides / pesticides analysis of groundwater. Herbicides and pesticides were not detected in any of the groundwater samples collected from the Facility.

Semivolatile Organic Compounds

Table 26 (Appendix B) presents the results of SVOCs analysis of groundwater. SVOCs were not detected in any of the groundwater samples collected from the Facility.

Volatile Organic Compounds

Table 27 (Appendix B presents the results of VOCs analysis of groundwater. VOCs were not detected in any of the groundwater samples collected from the Facility.

2.9.9.5 Non-Detected Analytes in Groundwater

Eighteen analytes that were analyzed in groundwater had PQLs greater than the HHS or RBSL, but were not detected in groundwater samples. Of the 18 analytes, 15 were analytes from the EPA 8270D method (SVOCs), two were analytes from the EPA 8260B method (VOCs), and one was from the EPA 8151 method (Herbicides). **Table 2.9-9** summarizes the analytes, analytical methods, HHS and RBSL values, PQLs, MDLs, and required reporting values (RRV) for these analytes.

MCPA was detected in subsurface soil samples, but was not detected in groundwater samples. However, the PQL for MCPA ranged from 95 to 250 µg/L in groundwater samples. This value is higher than the MCPA HHS of 3 µg/L. The MDL for MCPA in these samples ranged from 50.9 to 93.0 µg/L, suggesting that the method was not adequate to evaluate MCPA concentrations against the groundwater HHS. MCPA in soil exceed both generic and site-specific PGW screening levels in subsurface soils at the Facility. However, the first water-bearing unit encountered in all wells was confined. First-encountered water in wells within the landfill was 20 to 66 feet bgs, and the rise of the static water levels was 5.15 and 11.6 feet above first-encountered water. The lithology, weathered shales/mudstones, and clay with subordinate sandstone encountered during well installation also indicate a low potential for migration of MCPA to groundwater.

With the exception of MCPA, none of the remaining 17 analytes in **Table 2.9-9** exceeded the generic or site-specific PGW screening levels in soils at the Facility. Therefore, the analytes listed in **Table 2.9-9** are not likely to exist in groundwater at the Facility in concentrations that exceed HHS or RBSLs.

Table 2.9-9. Non-Detect Analytes with PQLs Greater than Groundwater HHS

Analyte	Method	Groundwater HHS or RBSL (µg/L)	MDL (µg/L)	PQL (µg/L)	RRV (µg/L)
MCPA	EPA 8151	3	48.5 - 93	95 - 250	0.008
1,2-Dibromo-3-chloropropane	EPA 8260B	0.2	0.25 - 0.7	2 - 10	0.02
1,2-Dibromoethane (EDB)	EPA 8260B	0.017	0.1 - 0.23	0.5 - 1	0.01
1,2-Diphenylhydrazine	EPA 8270D	0.3	1.8 - 2.5	10 - 10.2	0.04
2,4-Dinitrotoluene	EPA 8270D	0.49	1.4 - 2.2	10 - 10.2	0.2
2,6-Dinitrotoluene	EPA 8270D	0.5	1.5 - 2.3	10 - 10.2	0.2
3,3'-Dichlorobenzidine	EPA 8270D	0.49	2.7 - 5	50 - 51	5
4,6-Dinitro-2-methylphenol	EPA 8270D	2	1.2 - 3.6	10 - 10.2	10
Benzo(a)anthracene	EPA 8270D	0.5	1.4 - 5.1	10 - 10.2	0.1
Benzo(a)pyrene	EPA 8270D	0.05	2.1 - 2.4	10 - 10.2	0.06
Benzo(b)fluoranthene	EPA 8270D	0.5	1.1 - 2.5	10 - 10.2	5
bis(2-Chloroethyl) ether	EPA 8270D	0.3	2.2 - 2.3	10 - 10.2	5
Butylbenzylphthalate	EPA 8270D	1	1.8 - 1.9	10 - 10.2	10
Dibenz(a,h)anthracene	EPA 8270D	0.05	1.3 - 1.8	10 - 10.2	0.1
Hexachlorobenzene	EPA 8270D	0.2	1.5 - 2.6	10 - 10.2	0.03
Indeno(1,2,3-cd)pyrene	EPA 8270D	0.5	1.3 - 1.8	10 - 10.2	0.08
N-Nitroso-di-n-propylamine	EPA 8270D	0.05	2.2 - 2.3	10 - 10.2	5
N-Nitrosodimethylamine	EPA 8270D	0.0069	2.1 - 2.3	10 - 10.2	5

References for human health standards and risk based screening levels provided in Section 2.9.1.2
HHS - Human health standard
MDL - Method detection limit
RRV - required reporting value
RBSL - Risk based screening level PQL - Practical quantitation limit
8270D - Semivolatile organic compounds by gas chromatography/mass spectrometry
8270B - Volatile organic compounds by gas chromatography/mass spectrometry
8151 - Chlorinated herbicides by gas chromatography

2.10 HUMAN AND ENVIRONMENTAL EXPOSURE

Section 75-10-734(2)(i), MCA, requires that the VCP include a description of the human and environmental exposure to releases or threatened releases of hazardous or deleterious substances at the Facility based on the current and reasonably anticipated future uses of the Facility and adjacent properties. **Appendix P** includes the risk assessment files.

2.10.1 Ecological Risk Evaluation

The following sections present a Level 2 ecological risk assessment (ERA) in accordance with VCP and CECRA guidance documents (DEQ 2012 and 2017b) to assess the potential risk to the environment posed by the Facility. This ERA includes a discussion of the quality and abundance of habitat at the

Facility and a comparison of detected concentrations of chemicals in surface (0 to 2 feet bgs) and subsurface (2 to 10 feet bgs) soil to background concentrations and ecological risk-based screening concentrations (ERBSC).

2.10.1.1 Ecological Risk Assessment Approach

The VCP and CECRA guidance documents (DEQ 2012 and 2017b) both indicate that the extent to which the potential for ecological risk is discussed should be established based on the nature of the Facility and the potential for ecological receptors (plants, invertebrates, birds, and mammals) to occupy and be exposed to chemicals at the Facility (DEQ 2012 and 2017b). Given that the Facility is near open agricultural and rangeland areas, there is some potential for ecological exposure. However, the potential for exposure is tempered by the proximity to current and potential future residential development and other industrial and agricultural areas. As a result, this ERA includes a discussion of the quality and abundance of habitat at the Facility and a comparison of detected concentrations of chemicals in surface and subsurface soil to background concentrations and ERBSC.

2.10.1.2 Ecological Exposure Evaluation

As noted in **Section 2.10.1.1**, the nature of the Facility limits the potential for ecological receptors to occupy and be exposed to chemicals at the site. However, there is some potential for ecological exposure to chemicals in soil because the Facility is adjacent to open agricultural and rangeland areas.

LAND USE AND HABITAT CHARACTERIZATION

The 6.3-acre landfill property is owned by the City of Lewiston and is located on Marcella Avenue approximately 0.4 mile north of Highway 87. A former landfill occupies 4.4 acres of the property. The historical use of the property for wood treating and as a landfill have resulted in contamination on site. Current site use consists of (1) a small wood mill and biofuels operation, which uses multiple areas for staging equipment and supplies, and (2) part-time use of an on-site residence. A vehicle and machinery storage area also is present on a portion of the property. The Facility area experiences light vehicle traffic related to a nearby golf course and residential community. The Facility is surrounded by industrial, residential, and agricultural/rangeland use (**Figure 2, Appendix A**). The Facility consists of disturbed grassland habitat and bare soil areas. Habitat of equal or greater suitability for ecological receptors exists in the vicinity of the Facility. There are no surface water bodies or wetlands on or immediately adjacent to the Facility. There is a creek within a quarter mile of the Facility to the north (Breed Creek) and south (Boyd Creek), but these waterways do not appear to be impacted by contamination at the Facility.

Terrestrial and Aquatic Habitats

The Montana Animal Species of Concern Report prepared by the Montana Natural Heritage Program and Montana Fish, Wildlife and Parks (Montana Natural Heritage Program 2017) has documented 16 species of concern occurring within 10 miles of the Facility. None of these species is known to occur in developed areas such as the Facility, as these types of environments do not provide suitable habitat. There is habitat of equal or greater value to receptors in the vicinity of the Facility. Furthermore, the list includes fish that have the potential to occur only off site, and some waterbirds that are unlikely to occur at the Facility. Therefore, the aquatic species of concern listed below are not considered to be present at, or affected by, the Facility. There are no known plant species of concern at or near the Facility. **Table 2.3-6** in **Section 2.3.3.7**, above, presents a list of the species of concern within 10 miles of the Facility.

Sensitive Environments

Sensitive environments are defined in ARM 17.55.102 to include terrestrial or aquatic resources including wetlands, with unique or highly valued environmental or cultural features; an area with unique or highly valued environmental or cultural features; or a fragile natural setting. No sensitive environments have been found to occur at or near the Facility.

CHEMICALS AND EXPOSURE MEDIA OF POTENTIAL CONCERN

Soil is the exposure medium of concern at the Facility. Metals, SVOCs, VOCs, petroleum hydrocarbons, herbicides/pesticides, and dioxins and furans have been detected in soil samples collected at the Facility. There are no surface water bodies on site or adjacent to the Facility, and the first-encountered water-bearing zone was reported at depths of 20 to 66 feet bgs, too deep for ecological receptors to contact. Therefore, groundwater is not considered a medium of concern for ecological receptors.

POTENTIAL RECEPTORS AND EXPOSURE PATHWAYS

The Facility has some undeveloped areas that may represent some form of ecological habitat; however, no ecological receptors are expected to require the use of the Facility as primary habitat, and the site does not provide critical habitat for endangered or sensitive species. As noted above, habitat of equal or greater suitability for ecological receptors exists in the vicinity of the Facility. Potential ecological receptors that may be exposed to chemicals at the Facility include plants, invertebrates, birds, and mammals that occur in the area. They may be exposed to chemicals in soil via direct contact/uptake, incidental ingestion of soil while foraging or grooming, or ingestion of contaminated prey. Exposure would mainly be to surface soil, with the exception of plants and burrowing mammals, which may be exposed to subsurface soil at the site as determined by root and burrow depths. Inhalation of contaminated soil particles or vapors, though possible, is considered an insignificant pathway when compared with food-chain transfer and direct exposure to soils.

2.10.1.3 Ecological Exposure Estimation and Risk Characterization

As described in **Section 2.10.1.2**, there is a potential for ecological exposure to chemicals in soil at the Facility. However, there must be both exposure and the potential for toxic effects on ecological receptors for a site to pose a risk. A Level 2 ERA was conducted based on the land use and habitat characterization in **Section 2.10.1.2**, and DEQ guidance (DEQ 2017b) and includes a comparison of Facility soil concentrations with ERBSCs.

EXPOSURE ESTIMATION

Concentrations of chemicals detected at the Facility were compared with ERBSCs to estimate the potential for risk to ecological receptors, including plants, invertebrates, birds, and mammals. The following totals were calculated to evaluate the cumulative effects of chemical groups. All other chemicals were evaluated individually:

- Total low molecular weight (LMW) PAHs, which are PAHs that have molecular weights less than 200 atomic units, were calculated by summing detected concentrations of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, 1-methylnaphthalene, and 2-methylnaphthalene. All non-detected values were considered to be zero.
- Total high molecular weight (HMW) PAHs, which are PAHs that have molecular weights greater than 200 atomic units, were calculated by summing detected concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene,

benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene. All non-detected values were considered to be zero.

- TEQ values were developed for birds and mammals. TEQs are used to assess risk from dioxins and dioxin-like compounds (for example, polychlorinated dibenzodioxins, polychlorinated dibenzofurans, and dioxin-like polychlorinated biphenyls [PCB] congeners). The compound considered most toxic is TCDD, which is assigned a toxic equivalent factor (TEF) of 1.0. All other dioxin-like compounds are assigned a TEF of less than 1. The 2005 mammalian TEFs and 1998 bird TEFs published by the World Health Organization (Van den Berg and others 2006) are used in this ERA. The dioxin TEQ is calculated by summing the product obtained by multiplying each TEF by the dioxin and dioxin-like compound concentration detected at each sampling location. One-half of the detection limit is used as the concentration for non-detected congeners. The maximum dioxin TEQ at each zone of potential impact is used as the exposure point concentration (EPC) for dioxin.

Chemical concentrations in surface soil (0 to 2 feet bgs) and subsurface soil (greater than 2 feet bgs) were compared with background concentrations (when available) and ERBSCs selected from the following sources, listed in order of preference of selection:

- Lowest available Ecological Soil Screening Level (Eco-SSL) for plants, invertebrates, birds, or mammals (EPA 2017)
- Lowest available Oak Ridge National Laboratory benchmark for plants or invertebrates (Efroymson and others 1997a, b)
- Screening levels from other EPA Regions (EPA 2001, 2003).

These screening levels are considered safe or acceptable levels in soil, and concentrations lower than these values are considered protective of ecological receptors. Although a result that exceeds the ERBSC does not equate to unacceptable risk, the comparison of site concentrations with the ERBSCs can be used to identify those chemicals that are most likely to pose a risk and to determine whether a more detailed risk assessment is warranted. Furthermore, they can be used to assess the reduction in potential risk from any planned future remediation. Screening levels could not be obtained for some chemicals because relevant toxicological data are not available. **Tables 28** and **29 (Appendix B)** present a comparison of the site surface and subsurface soil concentrations with ERSBCs and background concentrations.

RISK CHARACTERIZATION

The comparison of Facility concentrations with ERBSCs shown in **Tables 28 and 29 (Appendix B)** indicates that a number of chemicals exceeded the ERBSCs. In particular, the ERBSCs for lead, mercury, PCP, and dioxins in both surface and subsurface soil are substantially exceeded. These chemicals all exceeded human health screening levels as well.

2.10.1.4 Conclusions and Recommendations

Based on the current and reasonably anticipated future uses of the Facility and adjacent properties, ecological receptors may be exposed to concentrations of chemicals in soil that pose a potential risk. However, the relatively small size of the Facility and the presence of habitat of equal or greater suitability nearby limits the impact. Furthermore, the chemicals of greatest potential concern identified by comparing Facility concentrations in soil with ERBSCs (cadmium, lead, mercury, and dioxins) also exceeded human health risk-based screening values. Therefore, any future soil remediation conducted to address human health risk concerns would reduce the potential for ecological risk as well, and no further ecological risk assessment is recommended.

2.10.2 Human Health Risk Evaluation

The following includes a description of the potential human exposure to releases or threatened releases of hazardous or deleterious substances at the Facility based on the current and reasonably anticipated future uses of the Facility and adjacent properties. This risk evaluation was conducted in accordance with DEQ guidance (2012).

2.10.2.1 Site Description

Sections 2.1.1 and **2.3** contain a description of the Facility.

2.10.2.2 Site Conceptual Exposure Model

A site conceptual exposure model (SCEM) was developed for the Facility based on current site conditions. The SCEM (**Figure 34**, **Appendix A)** shows the complete and incomplete pathways of exposure. Surface soil (0 to 2 feet bgs) exposure is considered complete for future hypothetical on-site residents as well as current and future on-site commercial workers through inhalation of volatiles and particulates, dermal contact with soil, and incidental soil ingestion. For the risk evaluation, on-site residential receptor and on-site commercial/industrial receptor scenarios were assessed for these pathways. Note that the SCEM includes visitors and trespassers, but the risks and hazards to these receptors will be far less than those estimated for the residential scenario. Therefore, they were not quantitatively assessed. (Both receptors would be exposed to the site for a shorter period of time, with less extensive soil contact.)

The assessment of on-site risks to future residential receptors will also be protective of current and future off-site residential and commercial/industrial exposures because off-site exposure receptors would experience a lower exposure concentration of site-related analytes, since off-site exposure would occur, if at all, through wind dispersion or runoff of impacted soil particles. The particles re-distributed through wind dispersion or runoff would result in off-site concentrations that are lower than on-site concentrations.

The pathways assessed for the residential and commercial/industrial receptors (0 to 2 feet bgs) and construction worker receptors (0 to 2 feet and below 2 to 10 feet bgs) were:

1. Ingestion of soil
2. Dermal contact with soil
3. Inhalation of particulates
4. Inhalation of volatilized chemicals

Monitoring data indicate groundwater has not been impaired by the site. Groundwater exposure is not evaluated because (1) Lewistown is supplied by municipal water service from Big Spring; (2) there are no groundwater wells at the Facility; (3) groundwater has not been affected; (4) in the future, municipal water will likely to be used; and (5) construction workers will not have contact with groundwater as the first water-bearing zone is greater than 30 feet deep.

The entire sampled area was used for the assessment of risks and selection of COPCs. To select COPCs, maximum concentrations of all detected chemicals were compared with residential RSLs (EPA 2016). Any concentration that exceeded its residential RSL (at a risk of 1E-6 or hazard index of 0.1) was retained for risk evaluation for all receptors. Background values were not used in the risk evaluation or selection of COPCs but are presented in **Table 2 (Appendix B)**.

2.10.2.3 Screening Levels

The EPA regional screening levels for residential and industrial scenarios were used to evaluate the Facility, along with calculated construction worker screening levels. The residential RSLs, published by

EPA (2016), assume exposure for 350 days per year (days/year) for 26 years for both child and adult receptors. The commercial/industrial RSLs assume an exposure of 250 days/year for 25 years using adult exposure parameters only. Ingestion of soil, dermal contact with soil, and inhalation of volatiles and wind-suspended particulates are included in the RSLs. These evaluations will be protective of off-site exposures and will be protective of on-site exposures that are temporary or intermittent in nature, such as a trespasser or occasional visitor. **Table 2.10-1** presents Risk Evaluation Screening Levels; non-carcinogen direct contact screening levels based on a target hazard index of 0.1.

Table 2.10-1. Risk Evaluation Screening Levels

Chemical	Residential RSL[1] (mg/kg)		Commercial / Industrial RSL[1] (mg/kg)		Construction Worker Screening Level[2] (mg/kg)	
	Carc	Non-carc	Carc	Non-carc	Carc	Non-carc (HI = 0.1)
Arsenic	0.68	3.5	3	48	33.8	19.5
Barium	NA	1,500	NA	22,000	NA	1.52E5
Cadmium	2,100	7.1	9,300	98	5.20E5	2.09E3
Chromium III	NA	12,000	NA	180,000	--	--
Lead	NA	153	NA	800	NA	800
Mercury[3]	NA	1.1	NA	4.6	NA	6.4
MCPA	NA	3.2	NA	41	NA	27
Pentachlorophenol	1	25	4	280	77.2	198
Dioxin TEQ	4.8E-6	5.1E-6	2.2E-5	7.2E-5	3.9E-4	4.6E-5
Methylene Chloride	57	35	1,000	320	--	--
1,2,3-Trichloropropane	5.1E-3	0.48	0.11	2.3	NA	4.1
1,2-Dibromo-3-chloropropane	0.0053	0.47	0.064	2.5	4.0	3.5
1,2-Diphenylhydrazine	0.68	NA	2.9	NA	52.7	NA
2,4-Dinitrotoluene	1.7	13	7.4	160	135.3	134.4
2,6-Dinitrotoluene	0.36	1.9	1.5	25	28.2	20.3
3,3'-Dichorobenzidine	1.2	NA	5.1	NA	93.7	NA
4,6-Dinitro-2-methylphenol	NA	0.51	NA	6.6	NA	5.4
Bis(2-chloroethyl)ether	0.23	NA	1	NA	32.2	NA
Dinoseb	NA	0.63	NA	82	NA	67.5
Hexachlorobenzene	0.21	6.3	0.96	93	25.9	71.4
Hexachloroethane	1.8	4.5	8	46	368.7	40.4
N-Nitrosodimethylamine	0.002	0.053	0.034	0.57	1.1	0.5
N-Nitrosodi-n-propylamine	0.078	NA	0.33	NA	6	NA
Tetrachloroethene	24	8.1	100	39	--	--
Benzo(b)fluoranthene	0.16	NA	2.9	NA	--	--
Benzo(k)fluoranthene	1.6	NA	29	NA	--	--
BIs(2-ethylhexylphthtalte	39	130	160	1600	--	--

Table 2.10-1. Risk Evaluation Screening Levels (Cont.)

Chemical	Residential RSL[1] (mg/kg)		Commercial / Industrial RSL[1] (mg/kg)		Construction Worker Screening Level[2] (mg/kg)	
	Carc	Non-carc	Carc	Non-carc	Carc	Non-carc (HI = 0.1)
Chrysene	16	NA	290	NA	--	--
Fluoranthene	NA	240	NA	3000	--	--
Phenanthrene	NA	NA	NA	NA	NA	NA
Pyrene	NA	180	NA	2,300	--	--
Aliphatic (C09-C18)	NA	110	NA	540	--	900
Aliphatic (C19-C36)	NA	24,000	NA	200,000	--	200,000
Aromatic (C11-C22)	NA	490	NA	3900	--	3,900
Aromatic (C09-C10)	NA	130	NA	1000	--	1,000
Naphthalene	3.8	13	17	59	--	--

1. From USEPA 2016 (available at http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search.) and DEQ (2016b) for petroleum products (aliphatic and aromatic compounds).
2. Calculated as shown in Attachment A.
3. Mercury was assessed assuming toxicity values for elemental mercury (inhalation) and inorganic mercury (oral) to be conservative. It was assumed to be volatile.
Carc – Carcinogenic
HI – hazard index
Mg/kg – milligram/kilogram Non-carc – Noncarcinogenic
RSD – Risk screening level

The construction worker scenario assumes an exposure of 250 days/year for 1 year, with a soil ingestion rate of 330 mg/day and 8-hour workday. Dermal contact with soil is also included in the screening level, as well as inhalation of wind suspended particulates and volatilized chemicals. **Attachment A** provides worksheets detailing the derivation of the construction worker screening levels. Volatilization factors, dermal absorption factors, and gastrointestinal absorption factors used in calculating the construction worker screening levels were from EPA 2016. In addition, the toxicity values selected followed the same hierarchy as the RSLs to be consistent with the residential and commercial/industrial screening levels used in this evaluation.

The screening values for lead have been established by EPA using the IEUBK and are not based on cancer risk or noncarcinogenic hazard, but rather on soil concentrations that would not lead to an unacceptable blood lead level (protective at a blood lead level of 10 µg/dL). Recently, the U.S. Centers for Disease Control and Prevention (CDC) established that blood lead levels lower than those previously evaluated may have effects. While the EPA has not yet adopted the CDC's recommendation, DEQ has used the IEUBK to calculate a protective soil concentration at the lower CDC blood lead concentration to assist in screening of contaminant concentrations. When the target blood lead concentration is set to 5 µg/dl, the soil concentration for lead is 153 mg/kg. Soil concentrations above this screening value require additional evaluation.

Screening levels for all analytes listed in **Table 2.10-2** are based on a risk of 1E-6 and hazard index (HI) of 0.1. Note that dichloroprop, benzo(g,h,i)perylene, and phenanthrene do not have RSLs. Risks and hazard indices were calculated using the following equations:

Equation 4. Risk Calculation

Risk = (Site Concentration / Screening Level) x 1E-6

Equation 5. Hazard Quotient

Hazard Quotient = (Site Concentration / Screening Level)

Equation 6. Total Risk

Total Risk (or Hazard Index) = Sum of individual chemical risks (or hazard quotients)

DEQ accepts a cumulative cancer risk for a facility of 1E-5 or less, and for noncarcinogens, a cumulative HI of 1.0 or less. All risks and HIs were summed to provide a total value for comparison to acceptable DEQ levels.

2.10.2.4 Surface Soil Evaluation

The soil depth of 0 to 2 feet bgs was sampled across the site, and maximum detected concentrations were used to characterize exposures under residential, industrial, and construction worker scenarios. **Table 2.10-2** evaluates which analytes were above residential RSLs and were retained for further risk evaluation. Dichloroprop, picloram, benzo(g,h,i)perylene, and phenanthrene were detected in surface soil, but do not have RSLs based on a lack of toxicity information. These four chemicals were not retained as COPCs or further evaluated.

Table 2.10-2. COPC Selection for Surface Soils (less than [<] 2 feet)

Analyte	Units	Max value		Residential RSL	Max > RSL?	COPC?	Reason
Arsenic	mg/kg	83.4		0.68	Yes	Yes	Exceeds RSL
Barium	mg/kg	3830		1500	Yes	Yes	Exceeds RSL
Cadmium	mg/kg	26	J	7.1	Yes	Yes	Exceeds RSL
Chromium	mg/kg	62.8		120000	No	No	Below RSL
Lead	mg/kg	53000		153	Yes	Yes	Exceeds RSL
Mercury	mg/kg	5.7	J	1.1	Yes	Yes	Exceeds RSL
Dichloroprop	µg/kg	93.6		NA	NA	No	No RSL
Dinoseb	µg/kg	127	J	6300	No	No	Below RSL
MCPA	µg/kg	11500		3200	Yes	Yes	Exceeds RSL
Pentachlorophenol	µg/kg	16800	J+	1000	Yes	Yes	Exceeds RSL
Picloram	mg/kg	0.0025	J	NA	NA	No	No RSL
Methylene Chloride	µg/kg	41.7	J	57000	No	No	Below RSL
Tetrachloroethene	µg/kg	212		24000	No	No	Below RSL
Benzo(b)fluoranthene	µg/kg	190	J	180	Yes	Yes	Above RSL
Benzo(g,h,i)perylene	µg/kg	126	J	NA	NA	No	No RSL
Benzo(k)fluoranthene	µg/kg	68	J	1800	No	No	Below RSL
bis(2-Ethylhexyl)phthalate	µg/kg	169	J	39000	No	No	Below RSL
Chrysene	µg/kg	162	J	18000	No	No	Below RSL
Fluoranthene	µg/kg	309	J	300000	No	No	Below RSL

Table 2.10-2. COPC Selection for Surface Soils (less than [<] 2 feet) (Cont.)

Analyte	Units	Max value		Residential RSL	Max > RSL?	COPC?	Reason
Phenanthrene	µg/kg	178	J	NA	No	No	No RSL
Pyrene	µg/kg	390	J	220000	No	No	Below RSL
Aliphatic (C09-C18)	mg/kg	147		110	Yes	Yes	Above RSL
Aliphatic (C19-C36)	mg/kg	118		24000	No	No	Below RSL
Aromatic (C11-C22)	mg/kg	31.4		490	No	No	Below RSL
Aromatic (C09-C10)	mg/kg	0.41	J	130	No	No	Below RSL
Naphthalene	mg/kg	0.069	J-	4.3	No	No	Below RSL
Dioxins & Furans (TEQ) DEQ Calculator	ng/kg	2926		4.8	Yes	Yes	Above RSL

1 - Residential RSL at risk of 1E-6 or hazard index of 0.1. Any chemical exceeding its residential RSL was retained for the risk evaluation for all receptors. Residential RSLs for some PAH and petroleum products from DEQ RBCA guidance (DEQ 2016b).

Mg/kg – milligram/kilogram; µg/kg – microgram/kilogram; RSL – risk evaluation screening level; COPC – chemical of potential concern; NA – not applicable; TEQ – toxicity equivalency; DEQ – MT Department of Environmental Quality; > – greater than; < – less than.

Tables 2.10-3, 2.10-4, and 2.10-5 present the results of the risk evaluation for residential, commercial/industrial, and construction worker exposures to surface soil. Table 3 Risk and Hazard Indices – Surface Soils (<2 feet) Using Res Screening Levels (SLs). Noncancer screening levels are based upon hazard quotient of 1.0.

Table 2.10-3. Risk and Hazard Indices – Surface Soils (<2 feet) Using Residential Screening Levels

Analyte	Units	Max value		Res SL - Cancer	Risk	Res SL – Non-cancer	Hazard Index
Arsenic	mg/kg	83.4		0.68	1.2E-04	35	2.4
Barium	mg/kg	3830		NA	NA	15000	0.26
Cadmium	mg/kg	26	J	2100.0	1.2E-08	71	0.37
Lead	mg/kg	53000		NA	NA	153	Exceeds Standard
Mercury	mg/kg	5.7	J	NA	NA	11	0.52
MCPA	mg/kg	11.5		NA	NA	32	0.36
Pentachlorophenol	mg/kg	16.8	J+	1	1.7E-05	250	0.07
Benzo(b)fluoranthene	mg/kg	0.19	J	0.16	1.2E-06	NA	NA
Aliphatic (C09-C18)	mg/kg	147		NA	NA	110	1.34
Dioxins & Furans (TEQ) DEQ Calculator	ng/kg	2926		4.8	6.1E-04	51	57.4
				TOTAL RISK	**7.5E-04**	**TOTAL HI**	**62.7**

Notes -
All concentrations are in units of mg/kg except dioxins, which are in units of ng/kg.
Noncancer screening levels are shown at a hazard index of 1.0
Mercury RSL is for elemental mercury.
HI – hazard index; Mg/kg – milligram/kilogram; µg/kg – microgram/kilogram; RSL – risk evaluation screening level; COPC – chemical of potential concern; NA – not applicable; TEQ – toxicity equivalency; DEQ – MT Department of Environmental Quality; > – greater than; < – less than.

Table 2.10-4. Risk and Hazard Indices – Surface Soils (<2 feet)
Using Commercial/Industrial Screening Levels

Analyte	Units	Max value		Construction Worker SL - Cancer	Risk	Construction Worker SL – Non-cancer	Hazard Index
Arsenic	mg/kg	83.4		3.0	2.8E-05	480	0.2
Barium	mg/kg	3830		NA	NA	220000	0.017
Cadmium	mg/kg	26	J	9300.0	2.8E-09	980	0.027
Lead	mg/kg	53000		NA	NA	800	Exceeds Standard
Mercury	mg/kg	5.7	J	NA	NA	46	0.12
MCPA	mg/kg	11.5		NA	NA	410	0.03
Pentachlorophenol	mg/kg	16.8	J+	4	4.2E-06	2800	0.01
Benzo(b)fluoranthene	mg/kg	0.19	J	2.9	6.6E-08	NA	NA
Aliphatic (C09-C18)	mg/kg	147		NA	NA	540	0.27
Dioxins & Furans (TEQ) DEQ Calculator	ng/kg	2926		22	1.3E-04	720	4.1
				TOTAL RISK	**1.7E-04**	**TOTAL HI**	**4.7**

Notes:
All concentrations are in units of mg/kg except dioxins, which are in units of ng/kg.
Non-cancer screening levels are shown at a hazard index of 1.0
Mercury RSL is for elemental mercury.
Mg/kg – milligram/kilogram; ng/kg – nanogram/kilogram; RSL – risk evaluation screening level; COPC – chemical of potential concern; NA – not applicable; SL – screening level; TEQ – toxicity equivalency; DEQ – MT Department of Environmental Quality; < – less than.

Using residential RSLs and the maximum concentration detected, the risk is 7.5E-4, and the total HI is 62.7. These results are mainly posed by dioxins and arsenic. In addition, aliphatic hydrocarbons in the C9-C18 range were associated with a hazard index of 1.3 for the residential scenario. These results exceed acceptable risk and hazard levels for a hypothetical residential receptor. Similarly, risk and hazards to commercial/industrial receptors based on the maximum detected concentrations were 1.7E-4 and 4.7, due mainly to dioxins and arsenic. Only dioxins posed a hazard index greater than 1 for the industrial scenario.

Risks and hazards to construction workers were also evaluated for surface soil using the maximum detected concentrations. The results are presented in **Table 2.10-6**. Risk and hazards to the construction worker were 1.0E-5 and 7.1, posed mainly by dioxins and arsenic. Again, only dioxins posed a hazard index greater than 1 for this scenario.

The maximum concentration of lead exceeded the residential and commercial/industrial screening levels, and is of potential concern for all receptors.

Table 2.10-5.Risk and Hazard Indices – Surface Soils
(<2 feet) Using Construction Worker Screening Levels

Analyte	Units	Max value		Construction Worker SL - Cancer	Risk	Construction Worker SL – Non-cancer	Hazard Index
Arsenic	mg/kg	83.4		33.8	2.5E-06	195	0.4
Barium	mg/kg	3830		NA	NA	1521857	0.003
Cadmium	mg/kg	26	J	520168	5.0E-11	20895	0.001
Lead	mg/kg	53000		NA	NA	800	Exceeds Standard
Mercury	mg/kg	5.7	J	NA	NA	64	0.09
MCPA	mg/kg	11.5		NA	NA	270	0.04
Pentachlorophenol	mg/kg	16.8	J+	77.2	2.2E-07	1980	0.01
Benzo(b)fluoranthene	mg/kg	0.19	J	54	3.5E-09	NA	NA
Aliphatic (C09-C18)	mg/kg	147		NA	NA	900	0.16
Dioxins & Furans (TEQ) DEQ Calculator	ng/kg	2926		390	7.5E-06	460	6.4
				TOTAL RISK	**1.0E-05**	**TOTAL HI**	**7.1**

Notes -
All concentrations are in units of mg/kg except dioxins, which are in units of ng/kg.
Noncancer screening levels are shown at a hazard index of 1.0.
Mg/kg – milligram/kilogram; ng/kg – nanogram/kilogram; RSL – risk evaluation screening level; COPC – chemical of potential concern; NA – not applicable; SL – screening level; TEQ – toxicity equivalency; DEQ – MT Department of Environmental Quality; < – less than.

2.10.2.5 Subsurface Soil Evaluation

COPCs for subsurface soils were selected by comparing maximum detected values from samples in the greater than 2 foot to 10 foot depth interval to residential RSLs. All analytes whose maximum concentration exceeded the residential RSL were included in the risk evaluation, which was conducted only for the construction worker scenario. **Table 2.10-6** shows COPCs selection process for the subsurface soil samples. Dichloroprop, MCPP, and total extractable hydrocarbons do not have screening levels and were not selected as COPCs or further assessed.

Table 2.10-6. COPC Selection for Subsurface Soil

Analyte	Units	Max value		Residential RSL (1)	Max > RSL?	COPC?	Reason
Arsenic	mg/kg	53.8		0.7	Yes	Yes	Above RSL
Barium	mg/kg	1580		1500.0	Yes	Yes	Above RSL
Cadmium	mg/kg	9.4		7.1	Yes	Yes	Above RSL
Chromium	mg/kg	54.4		120000.0	No	No	Below RSL
Lead	mg/kg	1180		153.0	Yes	Yes	Above RSL
Mercury	mg/kg	4.1		1.1E+00	Yes	Yes	Above RSL
2,4-D	µg/kg	46.9	J	70000	No	No	Below RSL
Dichloroprop	µg/kg	74.8	J	NA	NA	No	No RSL
MCPA	µg/kg	100000		3200	Yes	Yes	Above RSL
MCPP	µg/kg	9520		NA	No	No	No RSL
Pentachlorophenol	µg/kg	2000	J+	1000	Yes	Yes	Above RSL
Methylene Chloride	µg/kg	91.4	J	57000	No	No	Below RSL
Toluene	µg/kg	78.1		610000	No	No	Below RSL
Benzo(b)fluoranthene	µg/kg	239	J	180	Yes	Yes	Above RSL
Diethylphthalate	µg/kg	274	J	5100000	No	No	Below RSL
Pyrene	µg/kg	378	J	220000	No	No	Below RSL
Aliphatic (C09-C18)	mg/kg	121	J-	110	Yes	Yes	Above RSL
Aliphatic (C19-C36)	mg/kg	65.7	J-	24000	No	No	Below RSL
Aromatic (C11-C22)	mg/kg	60.7		490	No	No	Below RSL
Total Extractable Hydrocarbons	mg/kg	365		NA	NA	No	No RSL
Dioxins & Furans (TEQ_{MAMMAL})	ng/kg	866.25		4.8	Yes	Yes	Above RSL

Table 2.10-7 shows the risk evaluation for subsurface soils. Based on the maximum detected concentration, risk to the construction worker totaled 3.8E-6, posed mainly by arsenic (1.6E-6) and dioxins (2.1E-6). The total hazard index was 2.7, posed by dioxins (1.9). Lead exceeded the screening value of 800 mg/kg. Based on these results, subsurface soils could pose an unacceptable hazard to on-site construction workers.

Table 2.10-7. Risk and Hazard Indices – Subsurface Soils (>2 – 10 feet)
Using Construction Worker Screening Levels

Analyte	Units	Max value	Construction Worker SL – cancer	Risk	Construction Worker SL - noncancer (at HI – 1.0)	Hazard Index
Arsenic	mg/kg	53.8	33.8	1.6E-06	195	0.28
Barium	mg/kg	1580	NA	NA	1521857	0.001
Cadmium	mg/kg	9.4	520168.0	1.8E-11	20895	0.0004
Lead	mg/kg	1180	NA	NA	800	Exceeds Standard
Mercury	mg/kg	4.1	NA	NA	64	0.06
MCPA	mg/kg	100	NA	NA	270	0.37
MCPP	mg/kg	9.52	NA	NA	1980	0.00
Pentachlorophenol	mg/kg	2	77.2	2.6E-08	1980	0.001
Benzo(b)fluoranthene	mg/kg	0.239		4.4E-09	NA	NA
Aliphatic (C09-C18)	mg/kg	121	NA	NA	900	0.13
Dioxins & Furans (TEQ_{MAMMAL})	ng/kg	866.25	390	2.2E-06	460	1.9
			TOTAL	3.8E-06	**TOTAL**	2.7

Note:
All concentrations are in units of mg/kg except dioxins, which are in units of µg/L
TEQ mammal used to evaluate human health risks
Non-cancer screening levels shown at a hazard index of 1.0
Mg/kg – milligram/kilogram; ng/kg – nanogram/kilogram; RSL – risk evaluation screening level; COPC – chemical of potential concern; HI – hazard index; NA – not applicable; SL – screening level; TEQ – toxicity equivalency; DEQ – MT Department of Environmental Quality; > – greater than.

2.10.2.6 Risk Summary

Based on conservative exposure concentrations and parameters, the calculated risks and hazards for surface and subsurface soils pose risks or hazards above acceptable levels for residential receptors, commercial/industrial receptors, and construction workers. Arsenic and dioxin are the two analytes that pose consistently high risks in surface soil, and dioxins pose a hazard above 1.0 for subsurface soil to the construction worker. In addition, there are elevated detections of lead in both surface and subsurface soil.

Arsenic was detected in all 122 surface soil samples collected, with a concentration range of 5.9 to 83.4 mg/kg. In subsurface soil, arsenic was detected ranging from 3.4 to 53.8 mg/kg in 38 samples. The typical background concentration of arsenic in Montana soil is 22.5 mg/kg. Six samples in the 0 to 6 inches depth interval, 15 in the 1- to 2-foot depth interval, and six in the below 2- to 10-foot depth interval exceeded the background threshold value. All composite samples at the western and southern property boundary were below background. All samples exceeding the arsenic BTV are discrete locations inside the property boundary. It is more likely that a typical receptor would contact only the top 6 inches of soil, and the range of detections in that depth interval indicate that the average exposure concentration would not exceed background.

The arsenic BTV exceeds the risk-based screening levels for all receptors, so the risks associated with arsenic would likely not be lower than 1E-6 even in background soils. Calculated risks for arsenic in surface soil were 1.2E-4 for residential exposure, 2.8E-5 for commercial/industrial exposure, and 2.5E-6 for construction workers. Hazard indices associated with arsenic were 2.4 for residential exposures, 0.2 for commercial/industrial exposure, and 0.4 for construction worker exposure. In subsurface soil, risk from arsenic was 1.6E-6 and hazard index was 0.28 for the construction worker.

Dioxins also posed an unacceptable risk from surface soil exposures and were associated with a range of TEQ concentrations from 0.96 ng/kg to 2,926 ng/kg in surface soil, and 0.06 to 866 ng/kg. The risk from dioxin in surface soil was 6.1E-4 for the residential receptor, 1.3E-4 for the commercial/industrial receptor, and 7.5E-6 for the construction worker scenario. The hazard indices associated with dioxin in surface soil were 57.4 for the residential receptor, 4.1 for the commercial/industrial scenario, and 6.4 for the construction worker scenario. In subsurface soil, the risk from dioxin was 2.2E-6 and the hazard index was 1.9 for construction worker exposure.

Although the highest concentrations of dioxin were found in the center of the landfill property, two off-site samples east of the site boundary contained dioxin at levels above the residential RSL. Ten off-site composite soil samples (0 to 6 inch interval) to the south of the property boundary contained dioxin at concentrations above residential and commercial/industrial screening levels.

The range of lead concentrations in surface soil was 8.1 to 53,000 mg/kg and in subsurface soil from 8.5 to 1,180 mg/kg The background concentration for lead is 29.8 mg/kg, and the health-based screening levels are 153 mg/kg for residential and 800 mg/kg for commercial/industrial exposures. In the 0- to 6-inch depth interval, 11 of 44 discrete samples had concentrations in excess of 153 mg/kg. The residential standard was also exceed in the 1- to 2-foot depth interval. Nine samples in the 0- to 2-foot depth interval had concentrations in excess of the commercial/industrial screening value of 800 mg/kg. In the 2- to 10-foot depth interval, only two of the 20 samples exceeded the commercial/industrial standard of 800 mg/kg.

Exposure to all receptors under current site conditions would be more likely for the surface soil. Soil samples with lead exceeding 153 mg/kg are all contained within the landfill boundary, and composite samples around the perimeter of the Facility, including adjoining properties, are all below 153 mg/kg (with the exception of one composite sample on the western boundary, that had a lead concentration of 250 mg/kg in the 1- to 2-foot depth interval). The exposure assumptions associated with the screening level of 153 mg/kg are likely to be overly conservative for that location, given the depth of sample as well as the current use of the land (site boundary located next to Marcella Avenue).

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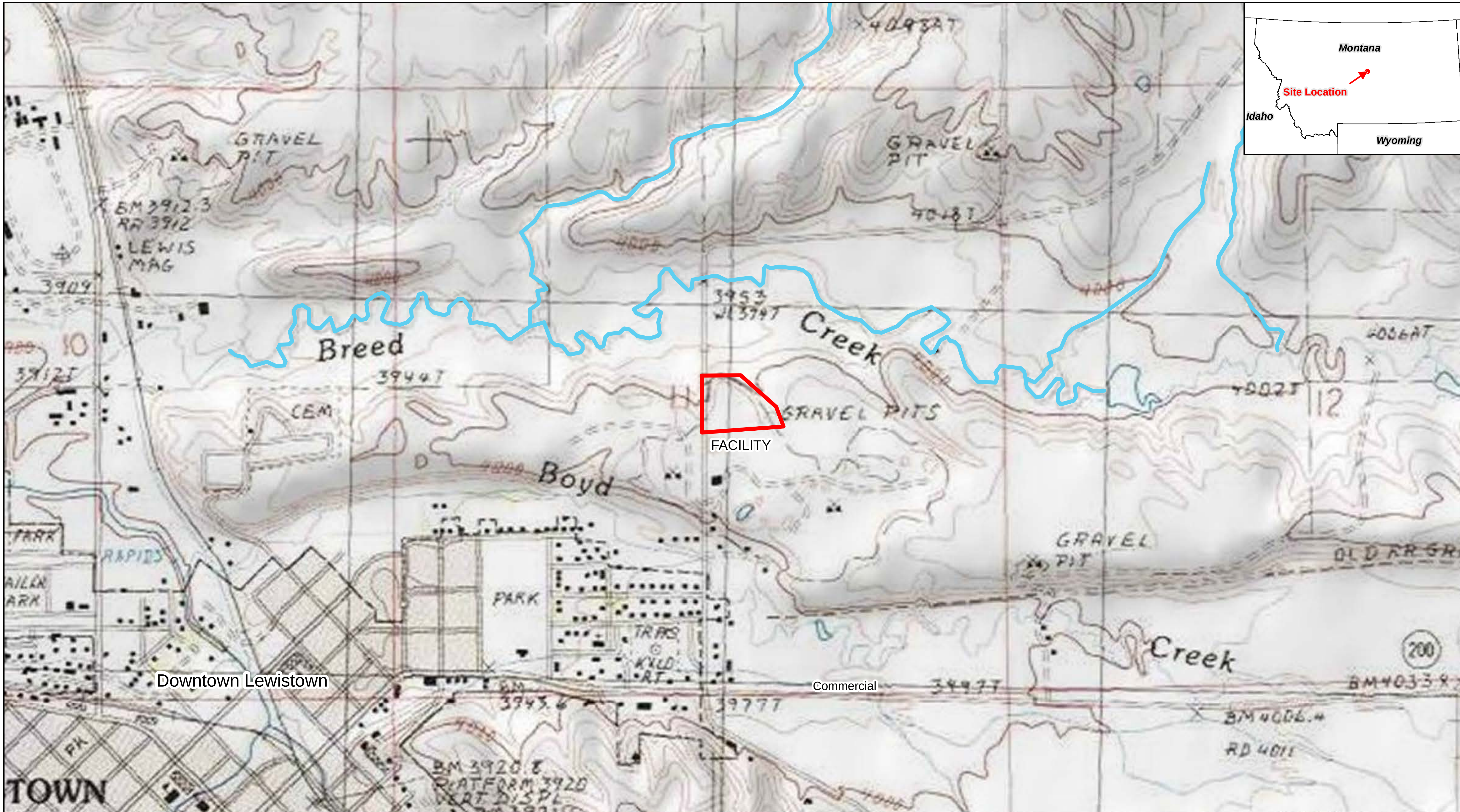
APPENDIX A – FIGURES



LEGEND

Property Boundary

N

0 400 800 Feet

Central Post and Treating Company (Facility)
Lewistown Orphan Landfill
Marcella Ave
Lewistown, Montana

Central Post and Treating Company
CECRA Facility

FIGURE 1

Location Map

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-1_Location map- SLM - 04/21/2017

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Figure_2_Site Map - SLM - 04/21/2017

LEGEND

Monitoring Well
Breed Creek
Parcel Boundary
Property Boundary
Subdivided Parcel Boundary

N
0 140 280 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Central Post and Treating Company
CECRA Facility

FIGURE 2

FACILITY MAP

TETRA TECH

DocuSign Envelope ID: 0A04F696-34C7-45CA-8667-86F88F114666

LEGEND

Methane Soil Vapor Monitoring
Monitoring Well
Site Feature
Aboveground Power Line
Buried Telco Line
Landfill Extent
Property Boundary
bgs Below Ground Surface
PCP Pentachlorophenol

N

0 50 100 Feet

Central Post and Treating Company
CECRA Facility

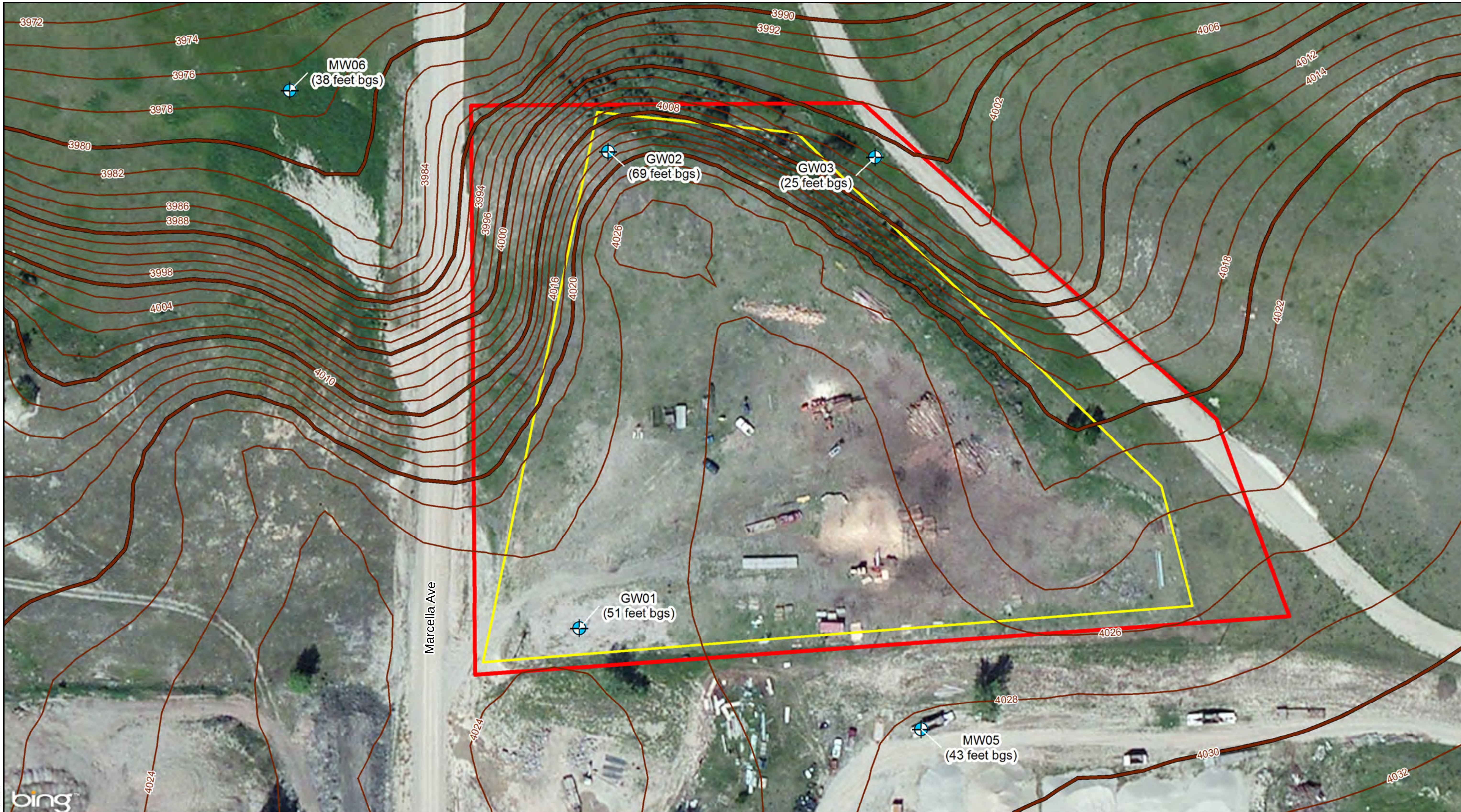
FIGURE 3

DETAILED FACILITY MAP

TETRA TECH

Figure-3_Detailed_Site Map - SLM - 04/25/2017

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



LEGEND

- Monitoring Well
- Interval - 10 feet
- Interval - 2 feet
- Landfill Extent
- Property Boundary
- bgs Below Ground Surface

N

0 40 80 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

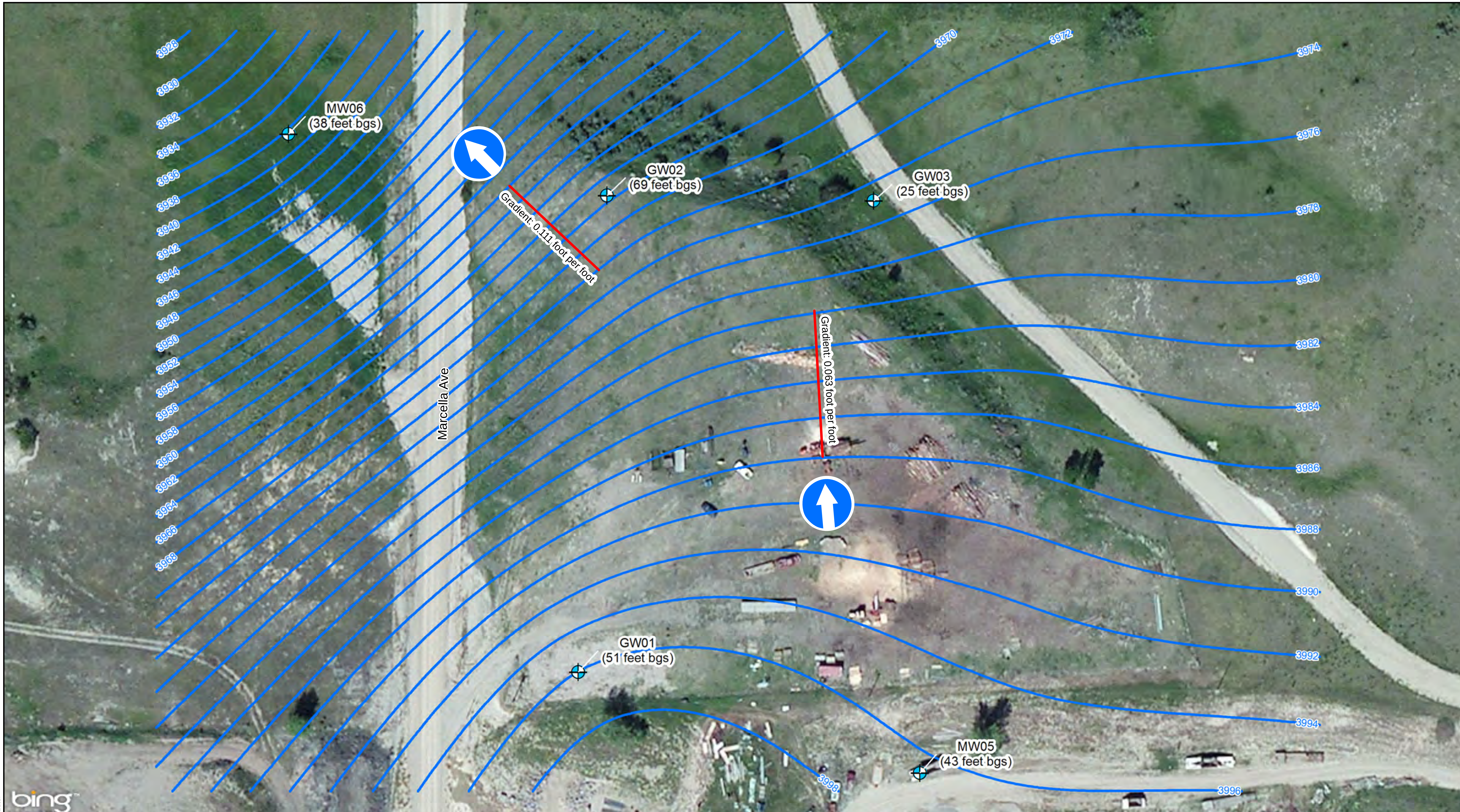
Central Post and Treating Company
CECRA Facility

FIGURE 4

TOPOGRAPHIC CONTOURS

TETRA TECH

Figure-4_Topographic_Contours.mxd - SLM - 4/21/2017



LEGEND

Monitoring Well — Potentiometric Contour (ft amsl)

Flow Direction — bgs: Below Ground Surface

ft amsl: Feet Above Mean Sea Level

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N

0 40 80 Feet

Central Post and Treating Company
CECRA Facility

FIGURE 5
POTENTIOMETRIC SURFACE
(FEBRUARY 2017)

TETRA TECH

Figure-5_Potentiometric_Surface - SLM - 4/21/2017

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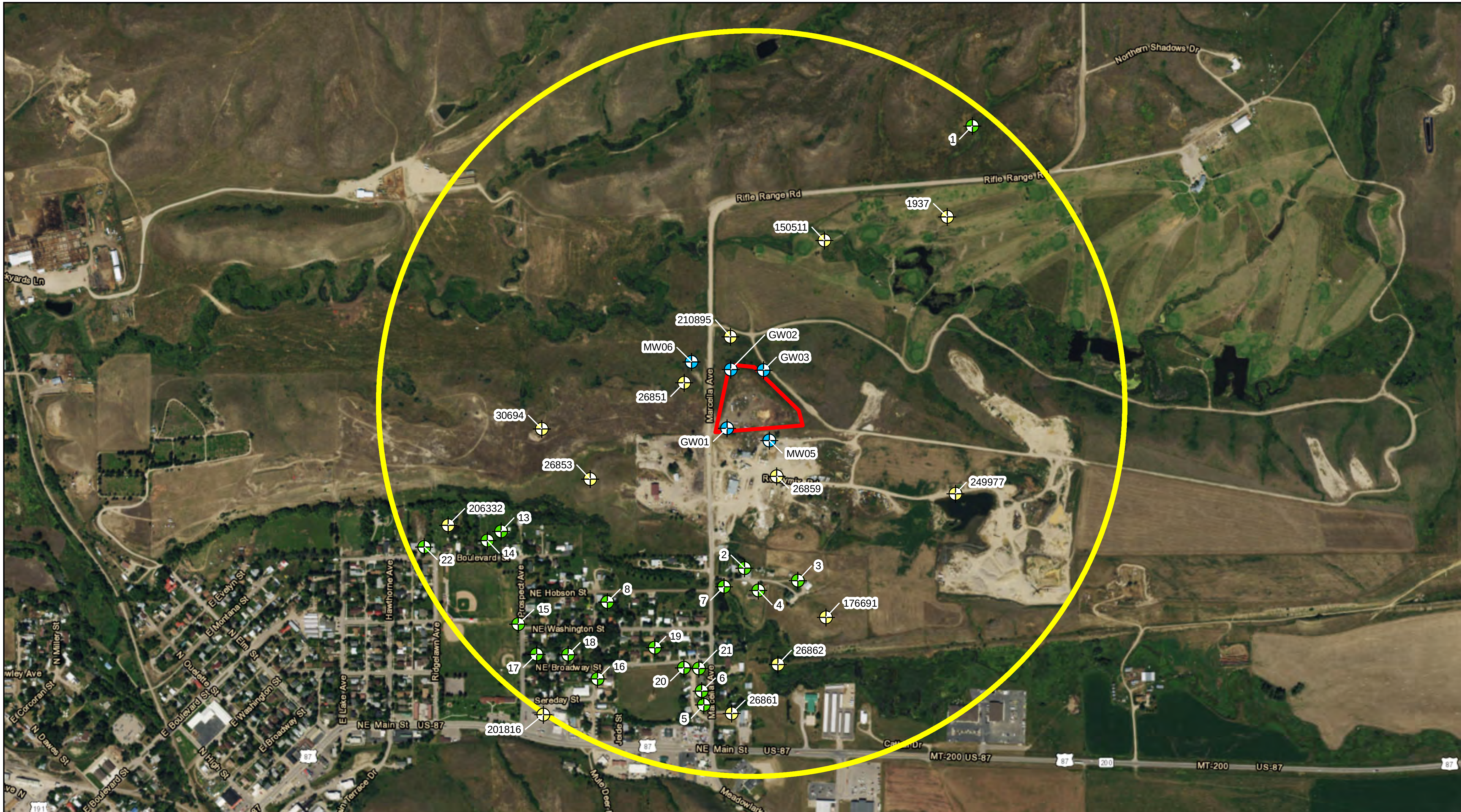


LEGEND

Facility Monitoring Well

GWIC Well

Tetra Tech Survey

Facility Boundary

Half-Mile Search Radius

Groundwater Information Center (GWIC) well logs and details of the Tetra Tech well survey are provided in Appendix G. The Tetra Tech well survey was conducted on April 6 and 7, 2017.

N

0 325 650 Feet

Central Post and Treating Company
CECRA Facility

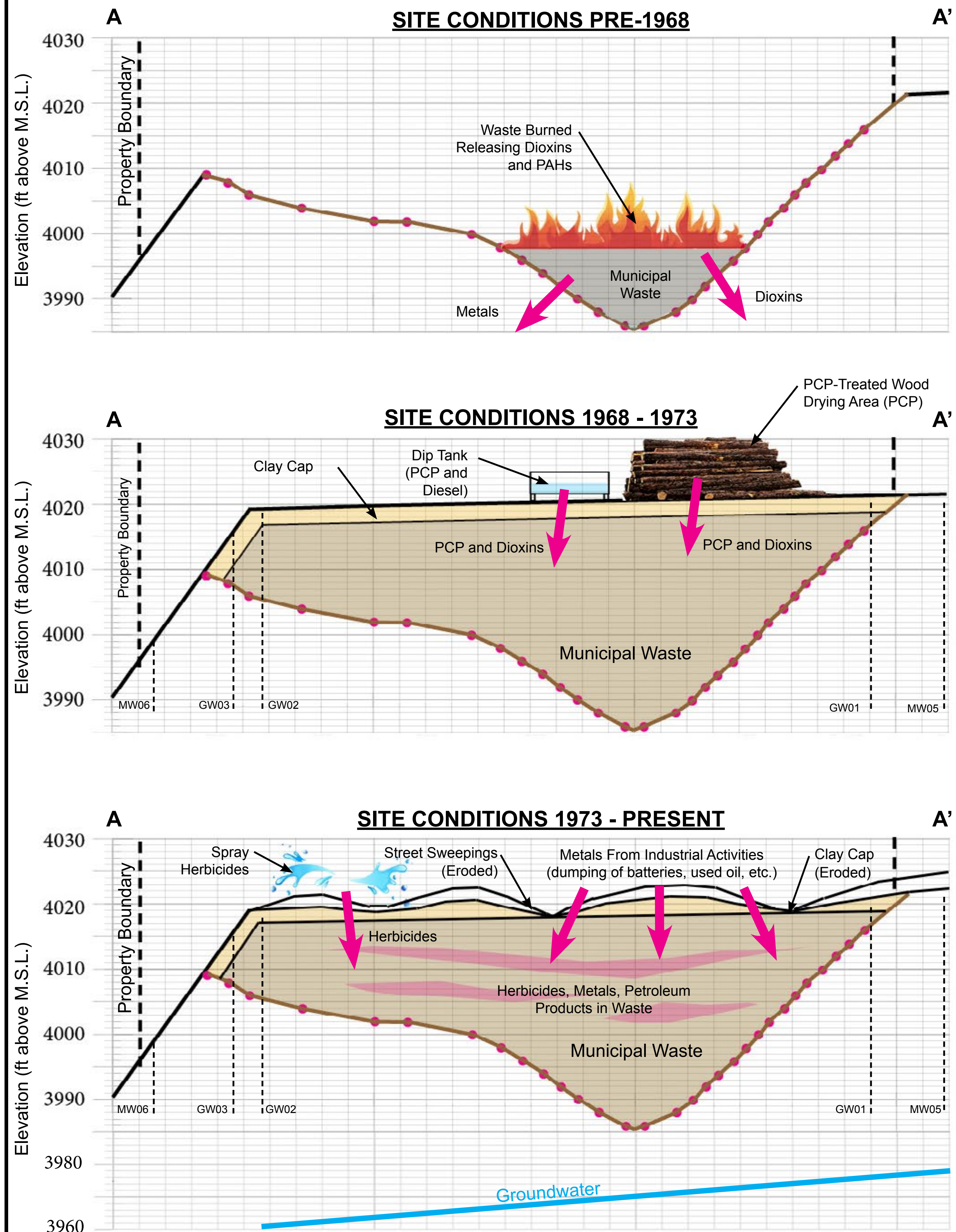
FIGURE 6

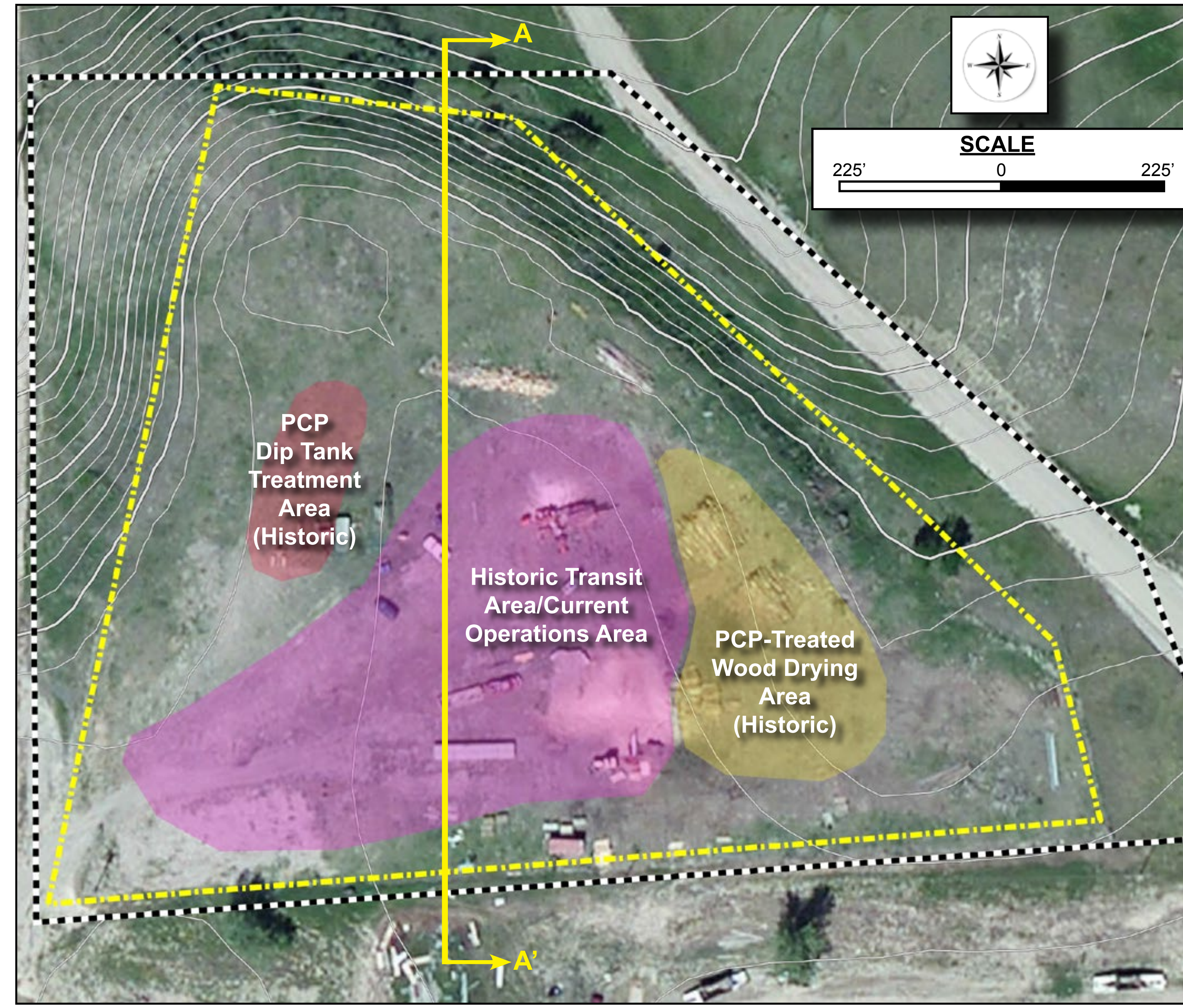
AREA WELLS

TETRA TECH

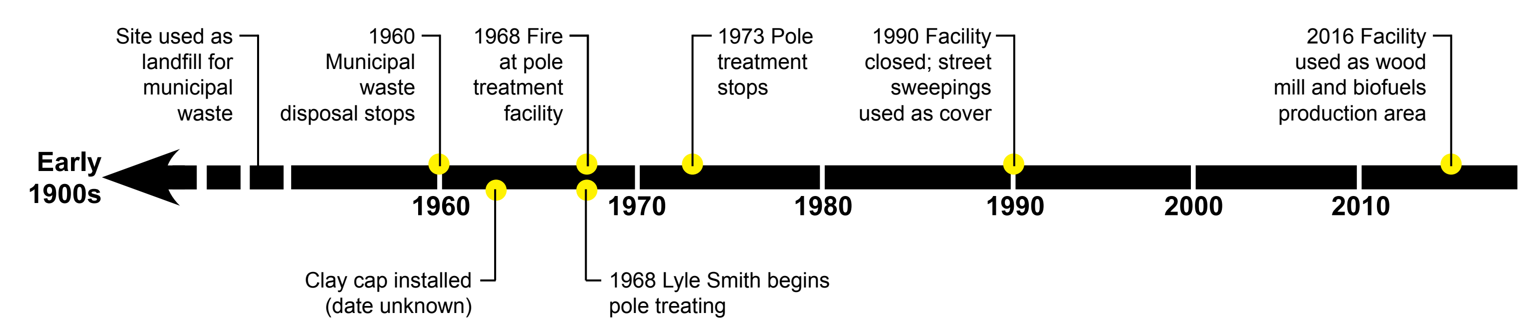
Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-6_AREA_WELLS - SLM - 04/21/2017





PLAN VIEW - CURRENT AERIAL WITH HISTORIC POLE TREATING FOOTPRINT



FACILITY TIME-LINE

Central Post and Treating Company
CECRA Facility

FIGURE 7
Conceptual Site Model

TETRA TECH

Figure 7 Conceptual Site Model.indd - By: JHD 4-28-2017

LEGEND

- Depth Measurement Location (ft bgs)
- Monitoring Well
- Depth to Waste Contour (Half foot Interval, ft bgs)
- Landfill Extent

Depth to Waste: 0 - 1 ft bgs; 1 - 2 ft bgs; > 2 ft bgs

ft bgs Feet Below Ground Surface

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N

0 35 70 Feet

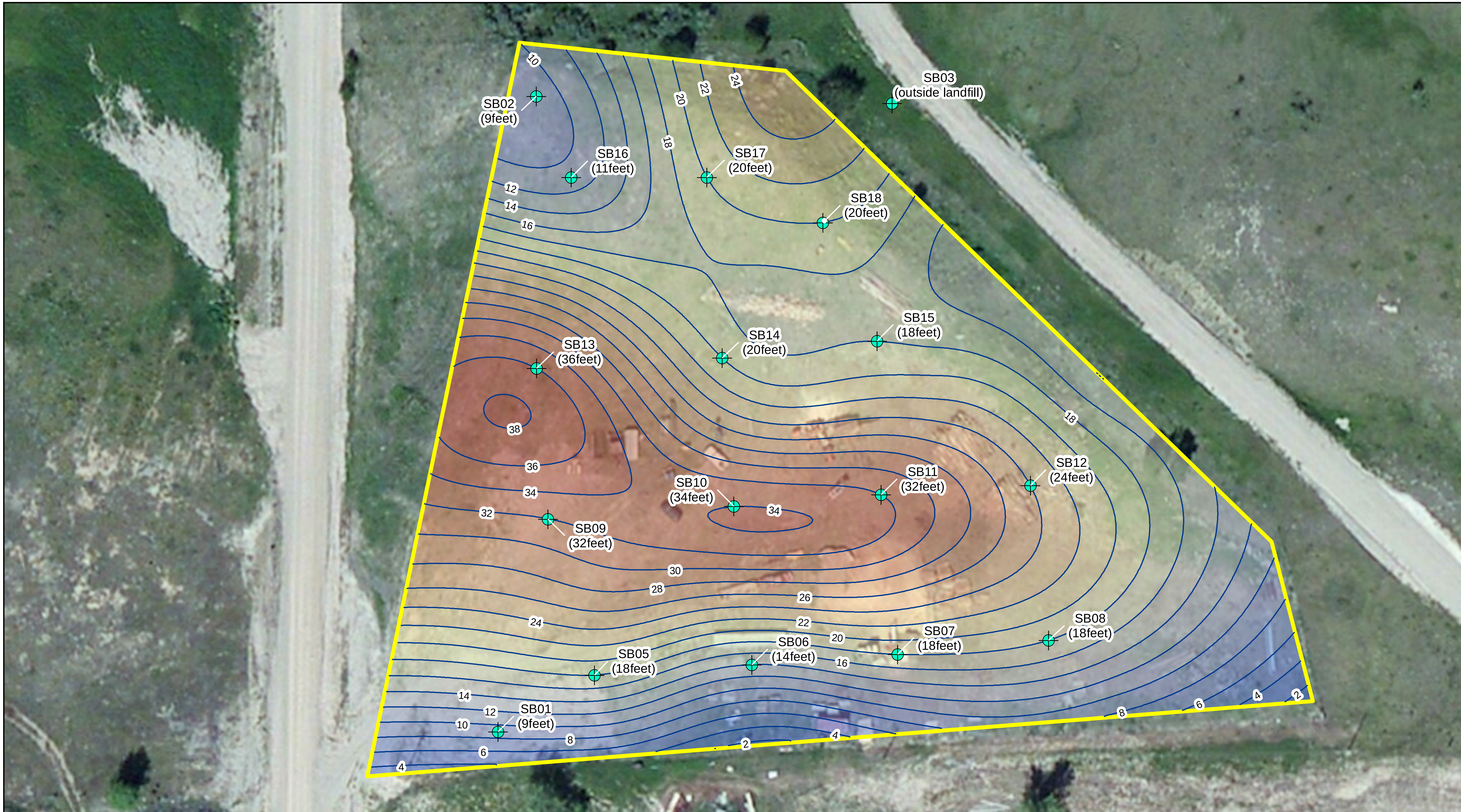
Central Post and Treating Company
CECRA Facility

FIGURE 8

Landfill Cover

TETRA TECH

Figure-8_Landfill_Cover - SLM - 04/21/2017



LEGEND

Landfill Depth Sampling Location

Landfill Extent

Landfill Depth Contour (2 feet Interval, ft bgs)

ft bgs Feet Below Ground Surface

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N

0 30 60 Feet

Central Post and Treating Company
CECRA Facility

FIGURE 9

LANDFILL DEPTH

TETRA TECH

Figure-9_Landfill_Depth - SLM - 04/21/2017

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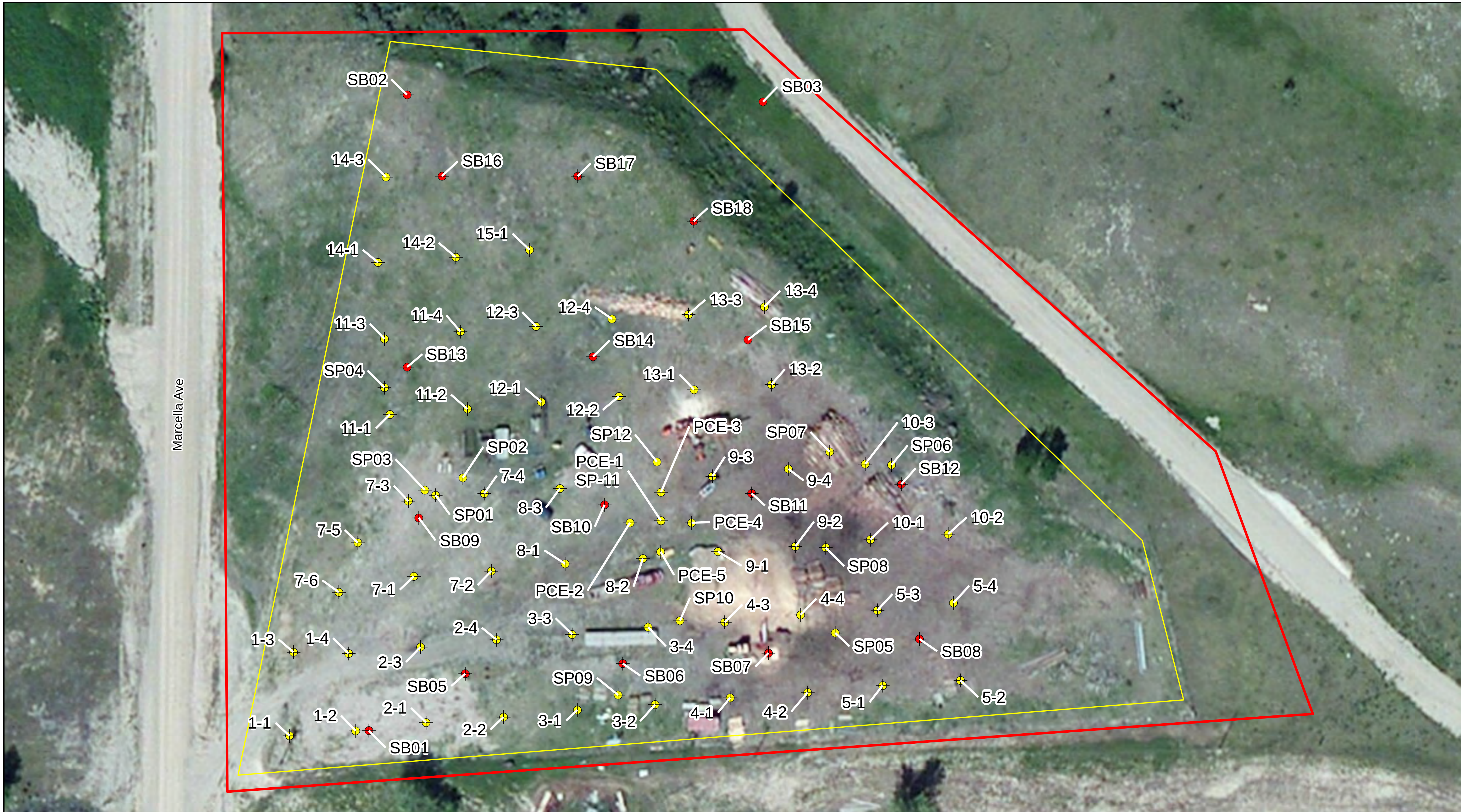

LEGEND

- Soil Excavation Pit
- Soil Boring
- Landfill Extent
- Property Boundary

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Central Post and Treating Company
CECRA Facility

FIGURE 10

SOIL BORING AND EXCAVATION SAMPLING

TETRA TECH

Figure-10_Soil_Sampling1 - SLM - 4/21/2017

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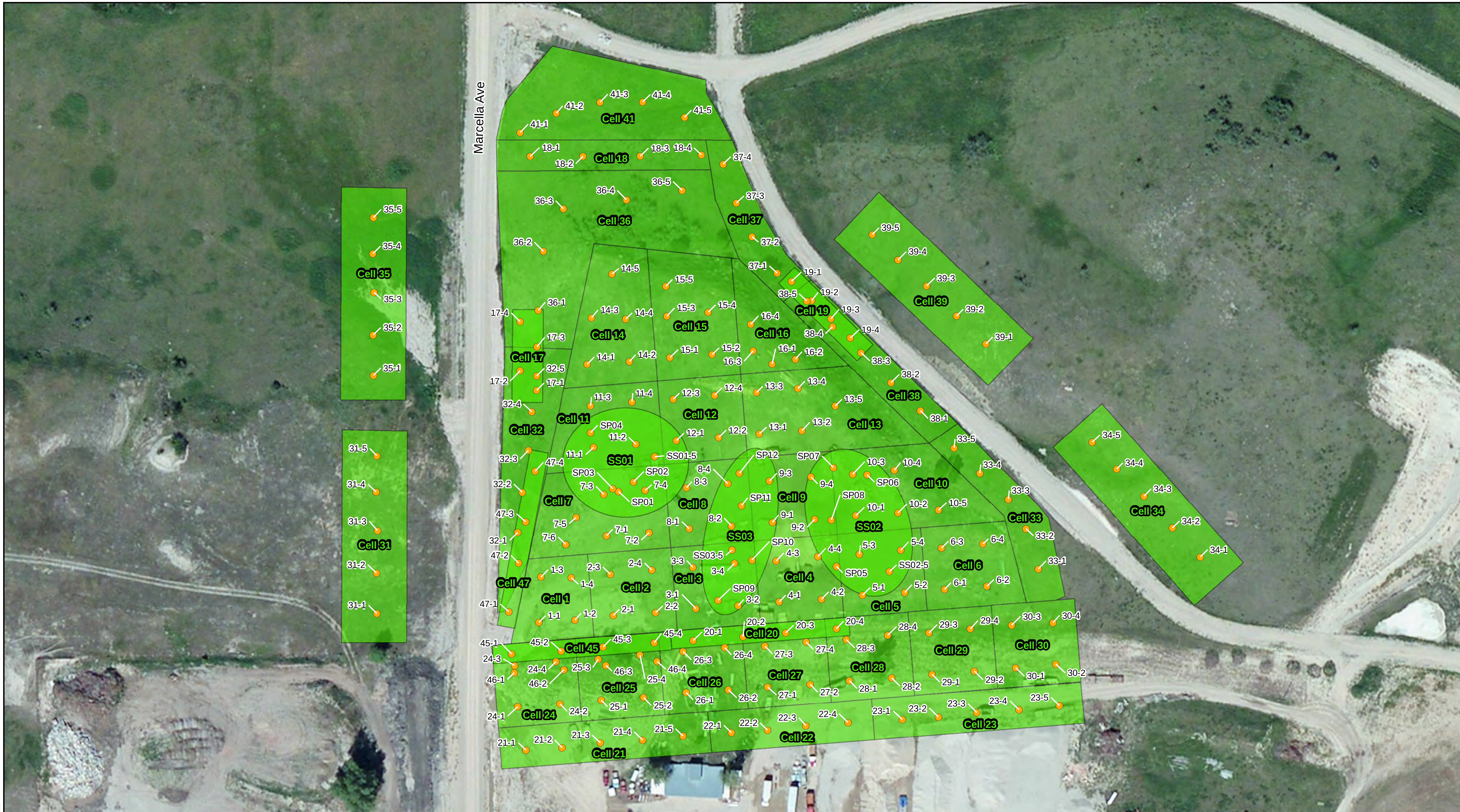


LEGEND

Sampled Cell Point

Sampled Cell Boundary

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

N

0 55 110 Feet

Central Post and Treating Company
CECRA Facility

FIGURE 11

GRID COMPOSITE SAMPLING

TETRA TECH

Figure-11_Soil_Sampling2.mxd SLM - 04/21/2017

LEGEND

Soil Sample (Results in mg/kg)

- Result less than background threshold value
- Result greater than background threshold value

Area Composite Sampling (Results in mg/kg)

- Result less than background threshold value
- Landfill Extent

Property Boundary

(G-2-2U) Sample ID

mg/kg Milligrams per kilogram

N

0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-12_Arsenic_6IN.mxd - SLM - 04/21/2017

Central Post and Treating Company
CECRA Facility

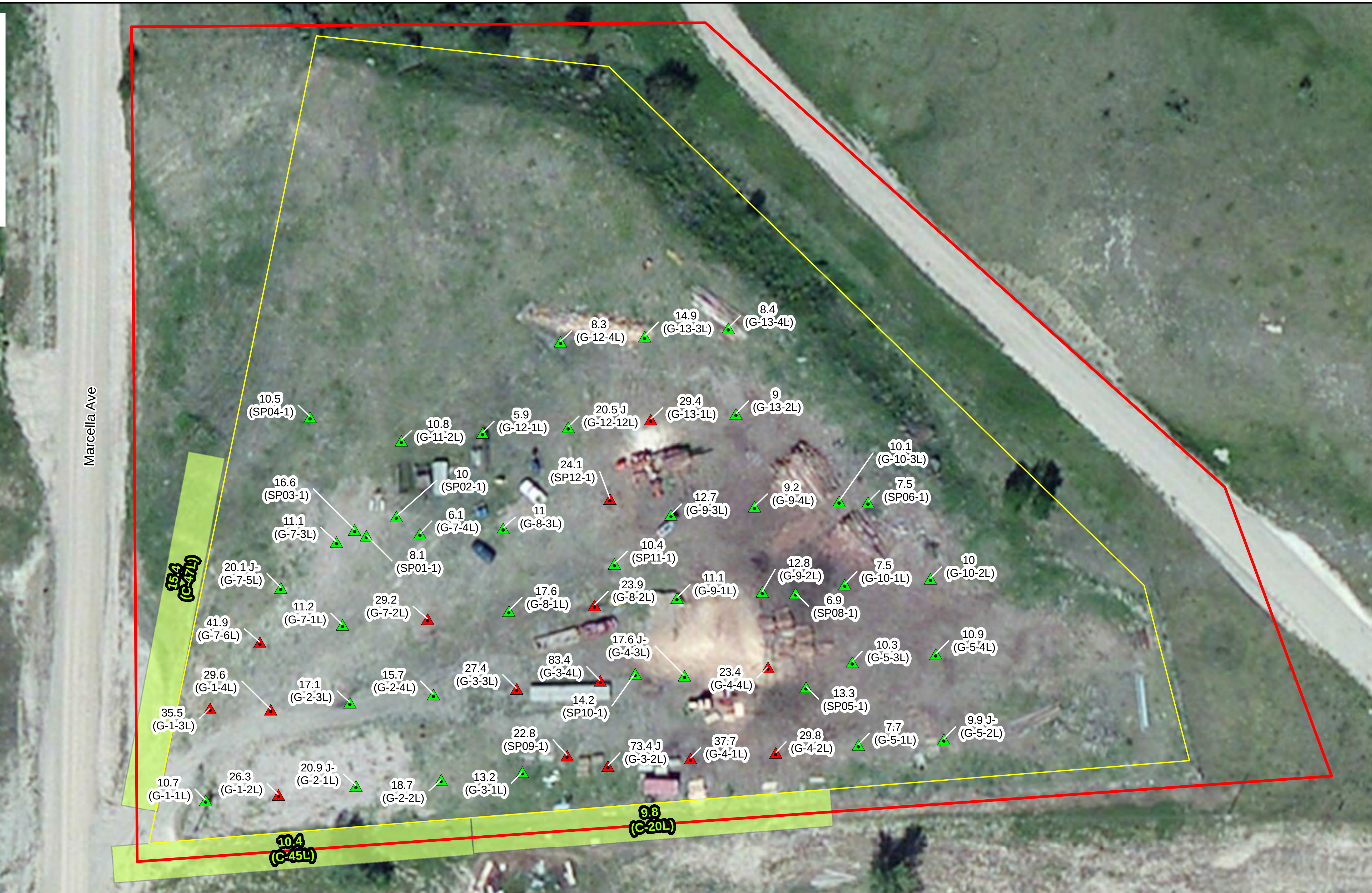
FIGURE 12

ARSENIC (0 - 6 INCHES)
SURFACE SOILS

TETRA TECH

Screening Levels (mg/kg)	
Residential DC:	0.68
Industrial DC:	3
Construction DC:	19.5
Generic PGW:	2.9
Site Specific PGW:	0.015
BTV:	22.5

BTV: Background threshold value
DC: Direct contact
PGW: Protection of groundwater



LEGEND

Soil Sample (Result in mg/kg)
- Result less than background threshold value
- Result greater than background threshold value

Area Composite Sampling (Results in mg/kg)
- Result less than background threshold value
- Landfill Extent

Property Boundary
(G-2-2L) Sample ID
mg/kg Milligrams per kilogram

N

0 30 60 Feet

Central Post and Treating Company
CECRA Facility

FIGURE 13

ARSENIC (1 - 2 Feet)
SURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-13_ARSENIC_2FT.mxd - SLM - 04/21/2017

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Figure-14_Barium_6IN.mxd - SLM - 04/21/2017

LEGEND

Soil Sample (Results in mg/kg)
- Result less than residential direct contact screening level
- Result greater than residential direct contact screening level

Area Composite Sampling (Results in mg/kg)
- Result less than residential direct contact screening level
- Landfill Extent

Property Boundary
(G-2-2U) Sample ID
mg/kg Milligrams per kilogram

N
0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Central Post and Treating Company
CECRA Facility

FIGURE 14

BARIUM (0 - 6 INCHES)
SURFACE SOILS

TETRA TECH

DocuSign Envelope ID: 0A04F696-34C7-45CA-8667-86F88F114666

Screening Levels (mg/kg)	
Residential DC:	7.1
Industrial DC:	98
Construction DC:	2090
Generic PGW:	3.8
Site Specific PGW:	21
BTV:	0.7

BTV: Background threshold value
DC: Direct contact
PGW: Protection of groundwater

LEGEND

Soil Sample (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Area Composite Sampling (Results in mg/kg)
- Result less than generic PGW screening level
- Landfill Extent

Property Boundary
(G-2-2U) Sample ID
mg/kg Milligrams per kilogram

PGW Protection of groundwater
J Value is an estimate

N
0 30 60 Feet

Central Post and Treating Company
CECRA Facility

FIGURE 16

CADMIUM (0 - 6 INCHES)
SURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-16_Cadmium_6IN.mxd - SLM - 04/21/2017

Screening Levels (mg/kg)	
Residential DC:	7.1
Industrial DC:	98
Construction DC:	2090
Generic PGW:	3.8
Site Specific PGW:	21
BTV:	0.7

BTV: Background threshold value
DC: Direct contact
PGW: Protection of groundwater

LEGEND

Soil Sample (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Area Composite Sampling (Results in mg/kg)
- Result less than generic PGW screening level
- Landfill Extent

Property Boundary
(G-2-2L) Sample ID
mg/kg Milligrams per kilogram
PGW Protection of groundwater
J Value is an estimate
J- Value is considered estimated and potentially biased low

N
0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-17_Cadium_2FT.mxd - SLM - 04/21/2017

Central Post and Treating Company
CECRA Facility

FIGURE 17

CADMIUM (1 - 2 FEET)
SURFACE SOILS

TETRA TECH

DocuSign Envelope ID: 0A04F696-34C7-45CA-8667-86F88F114666

Central Post and Treating Company
CECRA Facility

FIGURE 18

LEAD (0 - 6 INCHES)
SURFACE SOILS

TETRA TECH

Screening Levels (mg/kg)	
Residential DC:	153
Industrial DC:	679
Construction DC:	153
Generic PGW:	140
Site Specific PGW:	478
BTV:	29.8

BTV: Background threshold value
DC: Direct contact
PGW: Protection of groundwater

LEGEND

Soil Sample (Results in mg/kg)
- Results less than generic PGW screening level
- Results greater than generic PGW screening level

Area Composite Sampling (Results in mg/kg)
- Results greater than generic PGW screening level
- Results less than generic PGW screening level

Landfill Extent
Property Boundary
(G-2-2L) Sample ID

J Value is an estimate
J- Value is considered estimated and potentially biased low
mg/kg Milligrams per kilogram

PGW Protection of groundwater

N

0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-19_Lead_2FT.mxd - SLM - 04/21/2017

Central Post and Treating Company
CECRA Facility

FIGURE 19

LEAD (1 - 2 FEET)
SURFACE SOILS

TETRA TECH

LEGEND

Soil Sample (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Area Composite Sampling (Results in mg/kg)
- Result less than generic PGW screening level
- Landfill Extent

Property Boundary
(G-2-2U) Sample ID
J Value is an estimate
J- Value is considered an estimate and is biased low
J+ Value is considered an estimate and is biased high
mg/kg Milligram per kilograms
PGW Protection of groundwater

N

0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-20_Mercury_6IN.mxd - SLM - 04/21/2017

Central Post and Treating Company
CECRA Facility

FIGURE 20

MERCURY (0 - 6 INCHES)
SURFACE SOILS

TETRA TECH

LEGEND

Soil Sample (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Area Composite Sampling (Results in mg/kg)
- Result less than generic PGW screening level
- Landfill Extent

Property Boundary
(G-2-2L) Sample ID
J Value is an estimate
J- Value is considered an estimate and is biased low
J+ Value is considered an estimate and is biased high
mg/kg Milligram per kilograms
PGW Protection of groundwater

N
0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Central Post and Treating Company
CECRA Facility

FIGURE 21

MERCURY (1 - 2 FEET)
SURFACE SOILS

TETRA TECH

Figure-21_Mercury_2FT.mxd - SLM - 04/21/2017

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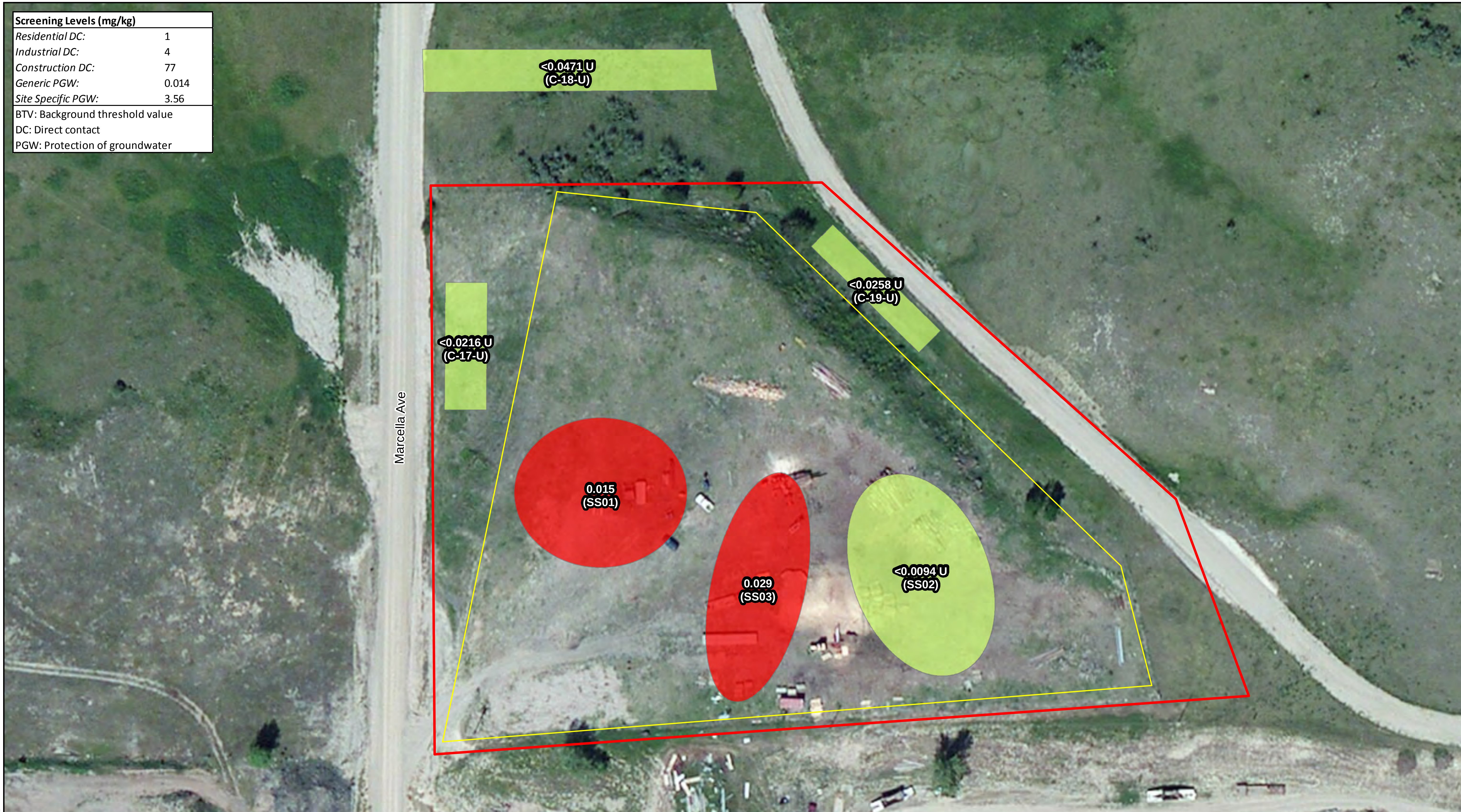

Screening Levels (mg/kg)	
Residential DC:	1
Industrial DC:	4
Construction DC:	77
Generic PGW:	0.014
Site Specific PGW:	3.56

BTV: Background threshold value
DC: Direct contact
PGW: Protection of groundwater

LEGEND

Area Composite Sampling (Results in mg/kg)
Result less than generic PGW screening level
Result greater than generic PGW screening level
Landfill Extent
Property Boundary
(G-17-U) Sample ID
mg/kg Milligrams per kilogram
PGW Protection of groundwater
U Constituent is considered not detected
< Constituent was not detected at or above the laboratory practical quantitation limit

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FIGURE 22
PENTACHLOROPHENOL (0 - 6 INCHES)
SURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-22_Penta_6IN.mxd - SLM - 04/21/2017

LEGEND

Soil Sample (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Landfill Extent
Property Boundary
(G-2-3L) Sample ID

J Value is an estimate
mg/kg Milligrams per kilogram
PGW Protection of groundwater

U Constituent is considered not detected
< Constituent was not detected at or above the laboratory practical quantitation limit

N
0 30 60 Feet

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FIGURE 23

PENTACHLOROPHENOL (1 - 2 FEET)
SURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-23_Penta_2FT.mxd - SLM - 04/21/2017

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Screening Levels (ng/kg)	
Residential DC:	4.8
Industrial DC:	22
Construction DC:	46
Generic PGW:	9.8
Site Specific PGW:	-
BTV:	1.36

BTV: Background threshold value
DC: Direct contact
PGW: Protection of groundwater

FIGURE-24_Dioxins_6IN.mxd - SLM - 04/21/2017

LEGEND

Area Composite Sampling (Results in ng/kg)

Result greater than residential direct contact screening level

Result less than residential direct contact screening level

Landfill Extent

Property Boundary

(C-24U) Sample ID

ng/kg Nanograms per kilogram

N

0 50 100 Feet

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FIGURE 24

DIOXIN AND FURANS (0 - 6 INCHES)
SURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

Soil Excavation Pit (Results in ng/kg)
- Result less than residential direct contact screening level
- Result greater than residential direct contact screening level

Area Composite Sampling (Results in ng/kg)
- Result greater than residential direct contact screening level
- Result less than residential direct contact screening level

Landfill Extent
Property Boundary

(C-24L) Sample ID
ng/kg Nanograms per kilogram

N

0 50 100 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FIGURE-25_Dioxins_2FT.mxd - SLM - 04/21/2017

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FIGURE 25

DIOXIN AND FURANS (1 - 2 FEET)
SURFACE SOILS

TETRA TECH

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LEGEND

Soil Boring (Results in mg/kg)
- Result less than background threshold value
- Result greater than background threshold value

Soil Excavation Pit (Results in mg/kg)
- Result less than background threshold value
- Result greater than background theshold value

Landfill Extent
Property Boundary

(SB05-1) Sample ID
(6 - 8 Feet) Sample Depth Below Ground Surface
mg/kg Milligrams per kilogram

N
0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-26_ARSENIC_10FT.mxd - SLM - 04/21/2017

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FIGURE 26

ARSENIC (2 - 10 Feet)
SUBSURFACE SOILS

TETRA TECH

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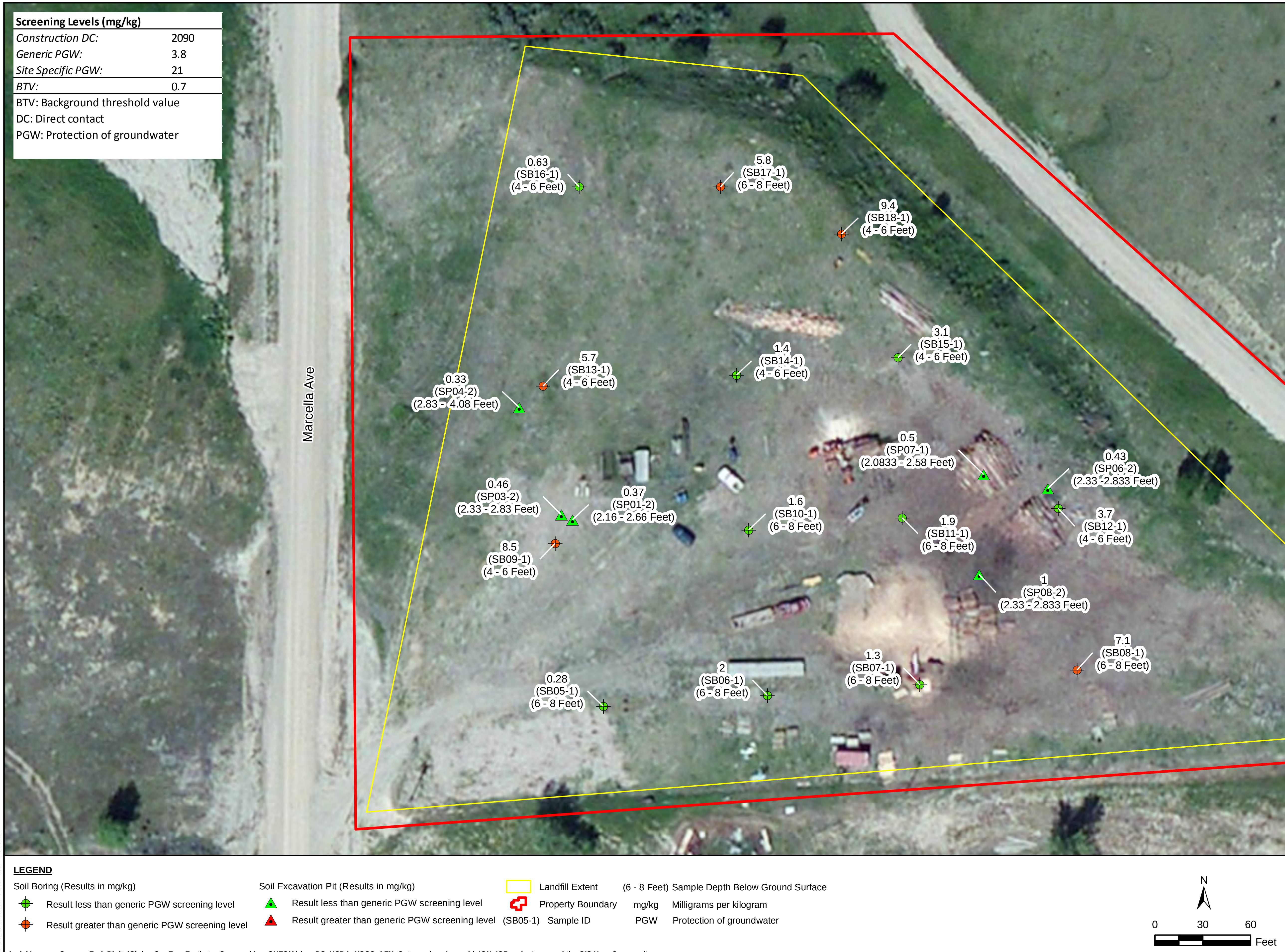

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FIGURE 27

CADMIUM (2 - 10 Feet)
SUBSURFACE SOILS

TETRA TECH

Screening Levels (mg/kg)	
Generic PGW:	3.8
Site Specific PGW:	21
BTV:	0.7
BTV: Background threshold value	
PGW: Protection of groundwater	

LEGEND

Soil Boring (Results in mg/kg)

- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Landfill Extent

Property Boundary

(SB05-2) Sample ID

(16 - 18 Feet) Sample Depth Below Ground Surface

J Value is an estimate

mg/kg Milligrams per kilogram

PGW Protection of groundwater

U Constituent is considered not detected

< Constituent was not detected at or above the laboratory practical quantitation limit

N

0 30 60 Feet

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FIGURE 28

CADMIUM (> 10 Feet)
SUBSURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-28_Cadmium_Deep.mxd - SLM - 04/21/2017

LEGEND

Soil Boring (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Soil Excavation Pit (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Landfill Extent
Property Boundary
(SB05-1) Sample ID

(6 - 8 Feet) Sample Depth Below Ground Surface
mg/kg Milligrams per kilogram
PGW Protection of groundwater
J- Result is considered estimated and is biased low

N
0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

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FIGURE 29

LEAD (2 - 10 Feet)
SUBSURFACE SOILS

TETRA TECH

Figure-29_Lead_10FT.mxd - SLM - 04/21/2017

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LEGEND

Soil Boring (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Landfill Extent
Property Boundary
(SB05-2) Sample ID

(16 - 18 Feet) Sample Depth Below Ground Surface
mg/kg Milligrams per kilogram
PGW Protection of groundwater

N
0 30 60 Feet

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CECRA Facility

FIGURE 30

LEAD (> 10 feet)
SUBSURFACE SOILS

TETRA TECH

Figure-30_Lead_Deep.mxd - SLM - 04/21/2017

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

Soil Boring (Results in mg/kg)

- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Landfill Extent

Property Boundary

(SB05-2) Sample ID

(16 - 18 Feet) Sample Depth Below Ground Surface

J Value is estimated

mg/kg Milligrams per kilogram

PGW Protection of groundwater

N

0 30 60 Feet

Central Post and Treating Company
CECRA Facility

FIGURE 31

MERCURY (> 10 Feet)
SUBSURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-31_Mercury_Deep.mxd - SLM - 04/21/2017

LEGEND

Soil Boring (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Soil Excavation Pit (Results in mg/kg)
- Result less than generic PGW screening level
- Result greater than generic PGW screening level

Landfill Extent
Property Boundary
(SB06-1) Sample ID

(6 - 8 Feet)	Sample Depth Below Ground Surface
J-	Value is considered an estimate and is biased low
J+	Value is considered an estimate and is biased high
mg/kg	Milligrams per kilogram
PGW	Protection of groundwater
U	Constituent is considered not detected
<	Constituent was not detected at or above the laboratory PQL

N

0 30 60 Feet

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure-32_Penta_10FT.mxd - SLM - 04/21/2017

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FIGURE 32

PENTACHLOROPHENOL (2 - 10 Feet)
SUBSURFACE SOILS

TETRA TECH

Screening Levels (ng/kg)	
BTV:	1.36
Industrial DC:	22
Construction DC:	46
Generic PGW:	9.833333
Site Specific PGW:	-

BTV: Background threshold value
DC: Direct contact
PGW: Protection of groundwater

LEGEND

Soil Boring (Results in ng/kg)
- Result less than residential direct contact screening level
- Result greater than residential direct contact screening level

Soil Excavation Pit (Results in ng/kg)
- Result less than residential direct contact screening level
- Result greater than residential direct contact screening level

Landfill Extent
Property Boundary

(SB05-1) Sample ID
(6 - 8 Feet) Sample Depth Below Ground Surface
ng/kg Nanograms per kilogram

N

0 30 60 Feet

Central Post and Treating Company
CECRA Facility

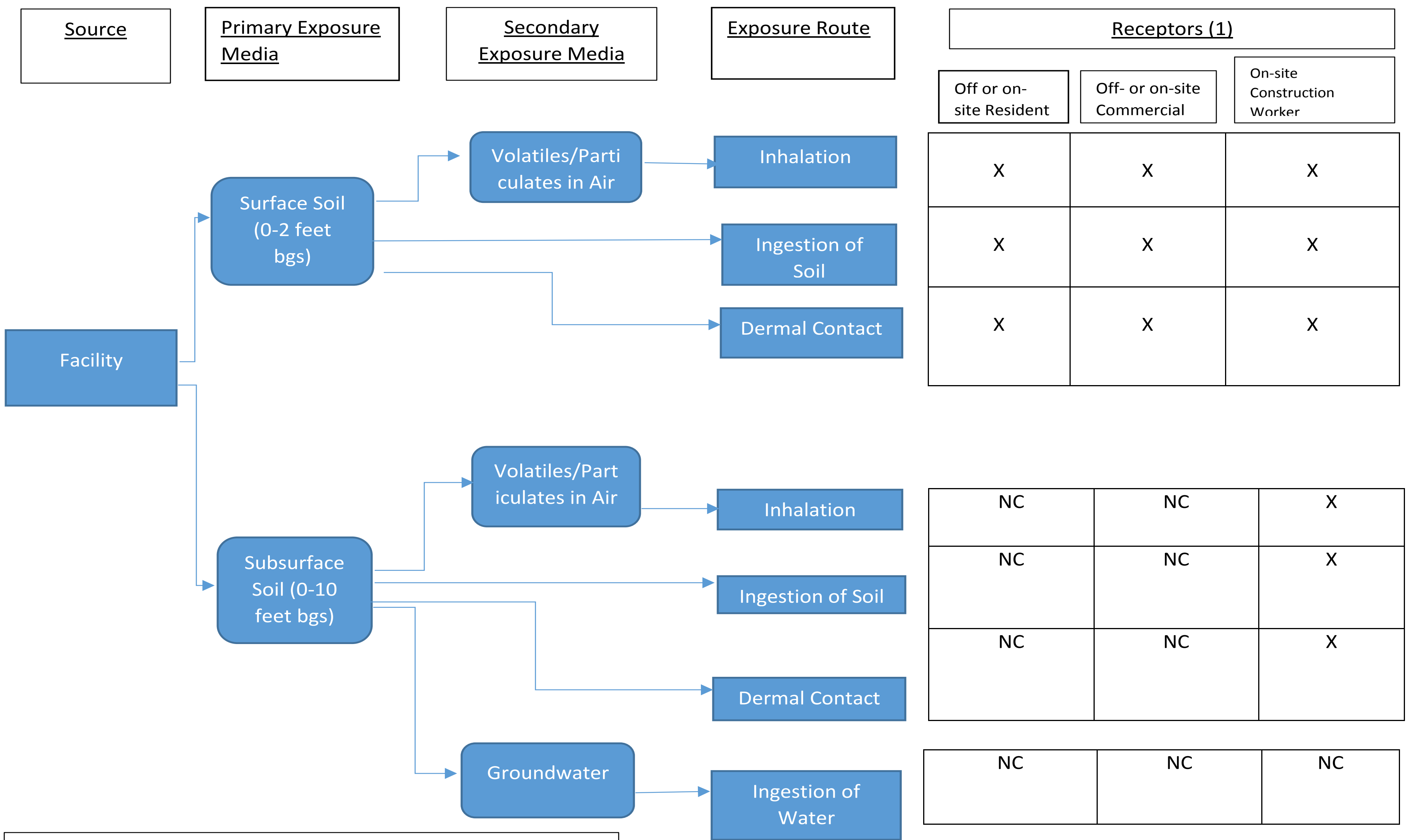
FIGURE 33

DIOXIN AND FURANS (2 - 10 FEET)
SUBSURFACE SOILS

TETRA TECH

Aerial Imagery Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FIGURE-33_Dioxins_10FT.mxd - SLM - 03/21/2017



(1) On-site risks calculated for each receptor will be higher than those expected for off-site receptors and will be protective of off-site exposures

X = Potentially complete pathway NC = Not Complete NA = Not Applicable

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FIGURE 34
Site Conceptual Exposure Model

TETRA TECH

APPENDIX B – TABLES

Appendix B through O

(provided on the attached CD)

APPENDIX C – WRITTEN CONSENT OF OWNERS, ACCESS & REIMBURSEMENT

APPENDIX D – QUALIFICATIONS OF PREPARERS

APPENDIX E – OWNERSHIP & HISTORICAL RECORDS

APPENDIX F – CLIMATE, WELLS & FLOOD & EDR RADIUS MAP

APPENDIX G – AREA WELLS, ORDINANCES & PLANNING

APPENDIX H – REGULATORY DOCUMENTS

APPENDIX I – WORK PLANS

APPENDIX J – FIELD NOTES & FIELD LOGS

APPENDIX K – PHOTOGRAPH LOG

APPENDIX L – LABORATORY ANALYTICAL REPORTS & DATA VALIDATION

APPENDIX M – WASTE DISPOSAL DOCUMENTS

APPENDIX N –SCREENING LEVELS

APPENDIX O – RISK ASSESSMENT